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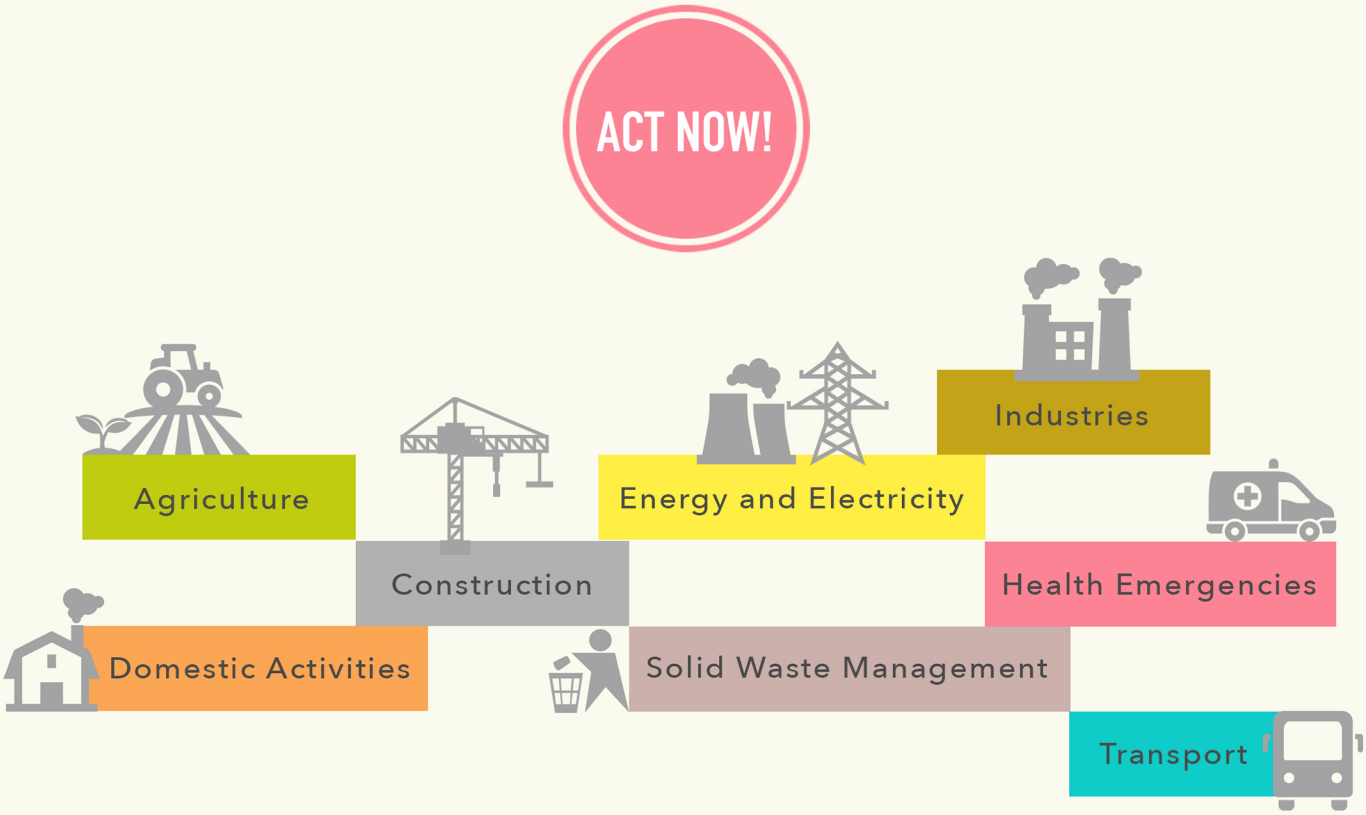
AIR QUALITY MANAGEMENT ACTION IN VIETNAMESE PROVINCES AND CITIES

Toolbox for Immediate Action



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Presenting the Toolbox for Immediate Action

Air pollution is a pressing issue in Vietnam, especially in urban areas. Industrial facilities, power generation, road traffic, burning of rice straw and waste, cooking and heating as well as livestock farming are among the emission sources contributing to air pollution. While it is important to collect data as information basis for air quality management planning and targeted measures, immediate action is necessary to reduce emissions in the short-term and to take care of the well-being of citizens.

The **Toolbox of Immediate Action** gives policymakers of Vietnamese cities and provinces measures at hand which have the potential to reduce existing emissions in their province and to protect people's health right away.

The National Assembly adopted the revised LEP in late 2020. Compared with Articles 62 to 64 of the current version of the LEP (No. 55/2014/QH13), the revised Law on Environmental Protection will, inter alia, provide for a legal basis for air quality planning at provincial level. As the planning process will take some time, immediate action should be taken in parallel to the development of Technical Guidelines and Air Quality Managements Plans as far as possible.

The purpose of this paper is to provide policy- and decision-makers recommendations for bridging the gap until air quality management plans have been adopted at provincial level. Therefore, measures for immediate action that can be taken within the current legal framework and without further research or evaluation have been identified. They include low-threshold legal measures, measures to enforce existing legal requirements and non-legal measures.

The **Toolbox of Immediate Action** is one out of three resources within the publication series **AIR QUALITY MANAGEMENT ACTION IN VIETNAMESE PROVINCES AND CITIES.** The other two publications for Vietnamese policy- and decision-makers comprise the **Air Quality Management Activities-Table (AQMA-table)** and the related **Local Air Quality Management - Manual**.

Contents

1. Background: Immediate action for air quality management

With the inclusion of provincial air quality planning into the revised LEP (Law on Environmental Protection), the Vietnamese government showed its interest in taking action to improve the quality of the ambient air and to protect the Vietnamese citizens from negative health impacts related to exceeded limit values of air pollutants.

The revised LEP and the accompanying Technical Guideline establish the legal prerequisites to build up essential administrative and measurement structures to plan, monitor and evaluate air quality management activities (AQM-activities) at the province level and its impacts to increase air quality. Learning from experiences from other countries, it can be expected that the installation of this technical-administrative infrastructure in the provinces will take several years.

Air quality is already nowadays a pressing challenge in Vietnam. It is therefore highly recommended to accompany the installation of technical-administrative infrastructure as defined in the LEP and its related Technical Guideline with immediate actions which can be put in practice right away. This way, the provinces and cities can take action to improve local air quality right now. They do not have to lapse precious time to contribute to better health conditions of its inhabitants.

While immediate actions have the potential to reduce emissions, they can also contribute to positive developments in other sectors. Some immediate actions have for example the potential to generate additional income for low-income and farmer households, or they can drive innovations. Provinces and cities should not lose time to start the preparation and implementation of these "no regret" AQM-activities, even before the air quality management plans have been adopted at the provincial level.

1.1 Air pollution as pressing issue in Vietnam

In 2018, the annual mean concentration of $PM_{2.5}$ in the ambient air in Ho Chi Minh City and Hanoi were 30,9 µg/m^3 and 40.1 µg/m^3. This exceeds the annual limit value of 25 µg/m^3 suggested by the Vietnamese government, and exceeds three to four times the international annual limit value of 10 µg/m^3 established by the World Health Organization (WHO).[1] The WHO guidelines are also widely exceeded in other Northern Provinces.[2]

Several studies predict a deterioration of ambient air quality in the next decades if no preventive measures are taken.[3] One recent study evaluating the emission sources in Northern Vietnam shows that emission sources and quantities differ widely among provinces and air pollutants. The study also modeled that the largest increase in ambient $PM_{2.5}$ in Northern Vietnam between 2015 and 2030 will be related to the power sector.[4]

The Vietnamese society is aware of the poor air quality and its impacts: In 2018, a survey found that air pollution was ranked the second biggest c oncern by Vietnamese people.[5]

➢ **Air pollution in Vietnam exceeds the WHO guidelines 3 to 4 times**

[1] GreenID (2019)
[2] Amann et al. (2019)
[3] Amann et al. (2019), Kopitz et al. (2017)
[4] Amann et al. (2019)
[5] GreenID (2019)

1.2 Negative impacts of air pollution

Also worldwide, the pollution of ambient outdoor air is among the most pressing environmental health issues. The WHO estimated that in 2016, around 4.2 million **premature deaths** were caused by ambient air pollution globally[6]. Out of this number, around 91% of the cases were registered in low- and middle-income countries, while inhabitants of the West Pacific and South-East Asia bear the highest burden.[7]

The exposure to high concentrations of PM_{10} and $PM_{2.5}$ is linked to an increasing occurrence of diseases such as **heart disease, acute and chronic respiratory diseases, stroke, lung cancer and asthma**, which in turn increase mortality and morbidity.[8] The susceptibility of humans to respiratory virus infections (including the coronavirus SARS-CoV-2) is also linked to air pollution[9].

Air pollution has multiple impacts on the environment. It causes climate change, haze and acid rain, accelerates eutrophication and ozone depletion and can lead to crop and forest damage.[10] The World Bank calculated that **polluted air burdens the global economy** annually with an estimated US$ 225 billion.[11]

- **Air pollution causes diseases and premature deaths.**
- **It has negative economic impacts.**

1.3 Gap until air quality managements plans are adopted

The revised LEP specifies that the provincial level is the basis to take action to improve ambient air quality. It defines provincial air quality management plans as the main tool to tackle air pollution and tasks MONRE with the development of technical guidelines for air quality management planning.

The National Assembly is expected to adopt the revised LEP at its 10th session in late 2020. The development of technical guidelines and the subsequent air quality management planning will take some years. However, immediate action can already be taken in parallel to reduce emissions, protect the health of citizens and to mobilize positive developments (so-called co-benefits) in other policy areas.

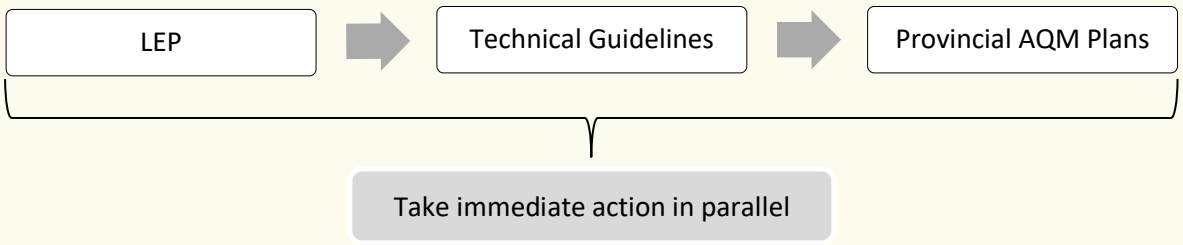

Figure: Timing of immediate action

- **Action need and can be taken now.**

[6] WHO (2019)
[7] WHO (2018a)
[8] WHO (2018a)
[9] Domingo & Rovira (2020)
[10] Saurabh et al. (2019)
[11] World Bank (2016)

1.4 Meaning of immediate action

The term immediate action is not a legal term. In this paper, it is used to describe measures that can be taken immediately, i.e. without the need to wait for first the technical guidelines and then the provincial air quality management plans to be adopted. Therefore, not only measures that unfold their impact in the short-term, but also medium- and long-term measures qualify as immediate action.

Immediate action can be taken within the current national legal framework, without the establishment of new regulations, and without further research and evaluation. They can be categorized as follows:

- Low-threshold legal measures, e.g. in regard to funding, equipment and expertise required
- Stricter enforcement of existing requirements and new requirements introduced by the revised LEP
- Non-legal measures, in particular, to raise awareness of citizens, businesses and authorities
- Pilot projects and other initial programs financed by the Vietnam Environmental Protection Fund (VEPF) or through contributions from businesses

Measures of immediate action can aim to reduce emissions from different emission sources, such as transport, industry or electricity production.

They can also focus on the protection of affected citizens like the recommendation to wear masks or to reduce outdoor activities.

Often, immediate actions are in many respects "no regret"-actions: They have the potential to reduce emissions, protect citizen health and can generate co-benefits in other sectors.

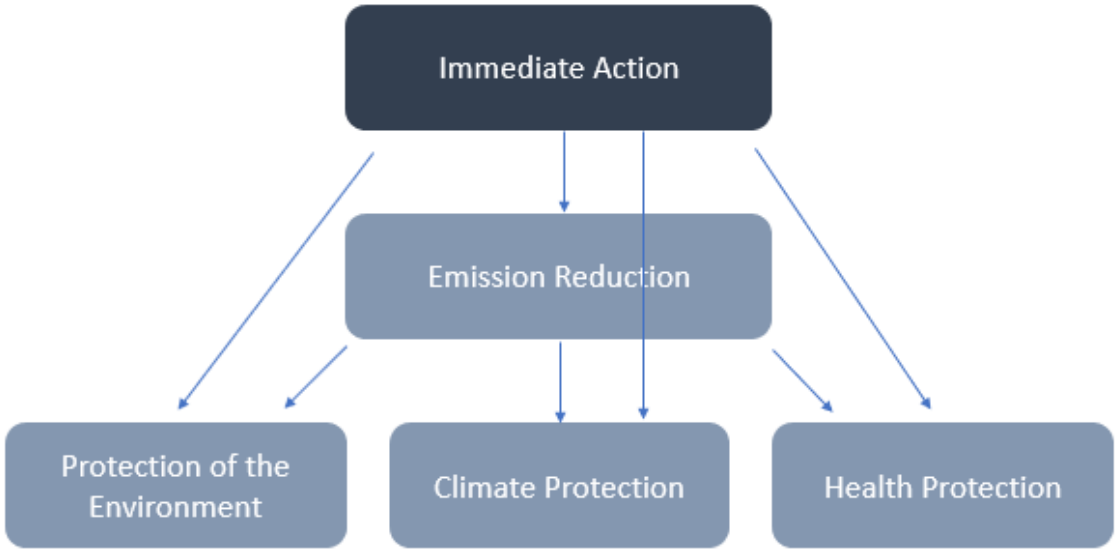

Figure: Objectives of immediate action

➢ **Immediate actions have important co-benefits**

1.5 No reason to postpone action: the data trap

One important component of air quality management is information about the status quo of air pollution. This includes information about emissions, i.e. about emission sources as well as the type and amount of pollutants, and information about ambient air quality at different locations.

This type of information together with subsequent modelling of possible future air quality developments enables the planning authority to decide on the appropriate measures to reduce emissions and to meet air quality standards. Therefore, the revised LEP and the related Technical Guideline defined this information as prerequisite for the planning of further AQM-activities.

Vietnam currently faces challenges regarding air quality related data:

- **Availability of data:** Although the number of stations for ambient air quality monitoring has increased in recent years[12], they only allow selective monitoring and do not describe the situation sufficiently. Also, comprehensive information about emission sources and emissions are still lacking in most provinces, as well as data about air quality-related diseases.
- **Reliability of data:** Even if data are available and shared, they may not always be reliable. The processing and understanding of raw data needs advanced (scientific) expertise. This is not always available in the competent authorities. It is also not always traceable whether the information shared reflects real-time data or an estimation based on earlier measurements.
- **Sharing of data:** Even if data are available, they are not necessarily shared across levels and sectors. Although procedures exist on paper, requests between ministries and authorities for sharing of data seem not always be answered.
- **Publication of data:** Although stations for ambient air quality monitoring and also measuring devices at industrial facilities collect data, the collected information is not always available to the public.

These challenges together pose difficulties to base the selection of suitable AQM-activities on available information only. While these challenges need to be addressed, they should not keep the competent authorities from taking immediate action in parallel.

Reasons to act now

…while monitoring systems and emission inventories are still established:

- Air pollution is at serious levels in many urban areas in Vietnam with all emission sources contributing. In this situation, it is more important to act immediately than finding the most suitable mix of measures – which can be done later as part of air quality management planning.
- There are first projections that ambient air quality will deteriorate if emission reduction measures are not successfully implemented starting from now.
- Important investments with long-term impact on air quality in urban areas are made on a continuous basis. To avoid lock-in effects, smart decisions need to be taken now.
- An early reduction of air pollutant emissions contributes to the reduction of Short-Lived Climate Pollutants (SLCPs) and therefore to the achievement of Vietnam's climate protection targets.
- Many immediate actions have the potential to simultaneously trigger positive developments in other sectors, such as agriculture or industries. This makes them non-regret measures having the potential to strengthen socio-economic development in the provinces.

[12] See for example People's Committee Hanoi: https://moitruongthudo.vn/

2. Emission reduction measures for immediate actions

Industrial facilities, power generation, road traffic, burning of rice straw and waste, cooking and heating as well as livestock farming are among the emission sources contributing to air pollution. While it is important to collect data as information basis for air quality management planning and targeted measures to reduce emissions, immediate action is necessary to improve air quality and protect the health of citizens right away.

What immediate actions are then suitable for my province? In general, it helps to take a closer look at the individual attributes of each action and to choose the activity being favourable in most aspects.

Table: Factors determining the decision for individual immediate actions

Emission sources	Type of measure	Cost-efficiency ratio	Competence	Time horizon[13]
• Industrial and energy plants • Energy and electricity • Transport and road traffic • Domestic activities • Solid waste management • Construction • Agriculture	• Regulatory • Economic/ incentive-based • Information/ communication • Educational • Participatory/ cooperative • Planning	• Implementation costs for households, businesses • Public expenditure	• Level of administration responsible for the activities (i.e. national, provincial, district, communal) • Sector, e.g. environment, transport, construction, finance • Knowledge of citizens	• Short-term • Medium-term • Long-term

[13] from starting point to actual emission reduction

An important factor: Cooperation and competences

As emissions of air pollutants come from sources in different sectors, also Air Quality Management activities are inter-sectoral in nature. This means that for the development and implementation of most air quality measures, local DONREs need to cooperate and coordinate with other public authorities at the province or city level being responsible for policies in other sectors.

Giving an overview of co-benefits of individual AQM-activities for other sectors can support the establishment of a cooperation with other public authorities for a common goal.

Immediate actions with indirect emission reduction potential

Some immediate actions might not lead to direct emission reductions but are important to create the necessary conditions in which emission reductions can then take place. They therewith lead to indirect emission reductions. Examples for such immediate actions are initiatives to build up a proper solid waste management system, which is necessary as an alternative to the open burning of waste.

2.1 Industrial and energy plants

Industrial production is an important emission source for most air pollutants in Vietnam, especially in and around urban areas. Industries with a large air pollutant emission footprint are the mineral industry (cement, lime, glass production and other), the chemical industry (mainly ammonia, nitric acid, carbide production and other), the metals industry (iron, steel, aluminium, lead, zinc, copper and other), as well as further industrial sectors such as pulp and paper.[14] Within these sectors, both, industrial plants located in industrial zones and smaller enterprises within craft villages can emit large quantities of air pollutants if no cleaning equipment is installed.

A major emission source within the industrial sector is energy and power production. Immediate actions relating to power generation are discussed in chapter 2.4: Energy and electricity.

The revised LEP sets the legal framework for AQM-activities in the industrial sector. It introduces an environmental permit system, requires automatic and continuous dust and exhaust gas monitoring for certain industrial plants, provides for the determination of emission limits further develops the rules on environmental impact assessment. Reducing emissions from the industrial sector will depend on the successful and **effective implementation and enforcement of these requirements by the operators as well as the competent authorities at national, provincial and city level**. This includes thoroughly planned inspections and the strict application of administrative and criminal sanctions in case of non-compliance.

To complement the instruments of the revised LEP, operators or business owners could be encouraged to set up emission reduction plans at plant or company level, to invest in the retrofitting of their plants and to implement dust prevention measures on a voluntary basis. Such **additional measures** should be coordinated between the environment and the industry sector.

IMMEDIATE ACTION IN THE INDUSTRIAL SECTOR

Structures for a regular measurement and monitoring of emissions from industry

- Creation and operation of a task force "Continuous emission monitoring system (CEMS) for industries" in the provincial authorities
- Set and enforce deadlines for the installation and operation of a continuous emission monitoring system (CEMS) for medium and large industries already operating in the province
- Pilot projects to install a CEMS in industrial smokestacks and to install a related reporting system
- Creation of a public website giving technical data on mayor point sources from industrial plants as identified in the emission inventory of the province or citv

[14] UBA (2020b)

Better enforcement of emission limits

- Timely establishment of an inspection plan for industries as well as strict and timely enforcement and communication of fines for violations of emission standards
- Establishment of a (digital) contact point at public authorities responsible for inspections to issue warning against companies violating existing emission standards
- Temporary operation restrictions for industrial plants and companies in craft villages in case of air quality emergencies

Emission reduction plans for industrial plants

- Pay special attention to emissions and their impact on air quality in the environmental impact assessment of industrial plants in urban areas
- Support voluntary emission reduction plans for all large industrial plants for a pre-defined transition period
- Pilot program "Clean Air Champions" and awards for a successful emission reduction planning of companies at plant level
- Website with overview of large industries in the province/city and their voluntary emission reduction plans
- Appointment and capacity-building for in-house emission managers for medium and large industrial plants and small companies in craft villages

Support of retrofitting activities for small and medium sized enterprises

- Provincial retrofitting assistance centre for small and medium enterprises (SMEs) in and outside of craft villages
- Tier-based financial subsidies for companies in craft villages and other small and medium enterprises, supporting a quick retrofitting of equipment
- Pilot project to support industrial plants in retrofitting to use waste-to-power with flue-gas cleaning equipment

Provincial retrofitting assistance center for small and medium-sized enterprises

Effect: Support in the reduction of emissions, including TSP, PM_{10}, $PM_{2.5}$, CO, SO_2, CO, through the promotion and support of retrofitting-activities in small and medium enterprises (SMEs), including enterprises within craft villages

Character: Technical and administrative support of mandatory and voluntary emission reduction activities

Target group: Industrial sector, including owners of small- and medium businesses within craft villages and industrial zones

In cooperation with: Department of Industry and Trade, Department of Planning and Investment, universities and scientific institutions for technical support, if suitable, VEPF for funds for small enterprises within craft villages

Conditions: The centre should combine the technical knowledge for retrofitting (including best available technologies, BATs) with administrative support. It should serve as contact point, share knowledge through workshops, give personal advice and identify and coordinate promising activities within the province.

Accompanying measures: Awareness raising and information-sharing among company managers together with positive incentives for companies taking part in the retrofitting initiative

2.2 Transport and road traffic

Especially in urban areas, road traffic of cars, motorbikes and trucks contributes to high concentrations of $PM_{2.5}$ in the ambient air, as e.g. shown for Northern Vietnam or Beijing, China.[15] But also shipping and civil aviation can contribute to local emissions, especially if the province or city in question possesses or is located near to an airport, a harbor or waterways used by large transport and passenger ships.[16]

Vehicles, and mostly older ones, emit air pollutants such as NO_x, CO, NMVOC and SO_2. These emissions can decrease sharply if catalytic-converters and other engine improvements are introduced and fuels of improved quality are used. The systematic introduction of such technologies often results from the tightening of emission laws for the transport sector.[17]

The LEP addresses environmental protection in the transport sector. While emission standards are set and tightened at national level according to the respective laws, provinces have to direct the traffic in order to limit air pollution.

Suitable immediate actions in the transport sector encompass all kinds of **initiatives to support public transport, regulatory measures to reduce heavy traffic, the support of cleaner vehicles and the establishment of green infrastructure**.

Air Quality Management actions related to transport should always be coordinated with the regional Department of Transport as the responsible entity for the sector, and with city governments and administrations.

[15] Amann et al. (2019), Ziyue Chen et al. (2019)
[16] Xin Bo et al. (2019)
Norwegian Maritime Authority (2018)
[17] UBA (2020a)

IMMEDIATE ACTIONS IN THE TRANSPORT SECTOR

Support of public and non-motorized transport

- Increase public transport capacities such as busses and metro
- Enabling free public transport for citizens in times of severe pollution
- Local awareness campaign on public transport, cycling and walking
- Improve the availability of school busses to reduce individual transport of students and their parents
- Establishment, expansion and upgrading of bicycle lanes to increase their safety, e.g. by using color markings

Measures to reduce road traffic and its emissions

- Introduction of alternating traffic between groups of motor vehicles to regulate their movement
- Establishment or extension of ramp metering lights before congestion-prone street segments
- Gradual restriction of motorcycle vehicle traffic, e.g. during certain times of the day
- Ban on heavy trucks in specified areas, e.g. in certain residential areas
- Temporary driving restrictions for motorbikes, trucks and cars in times of severe air pollution
- Introduction or expansion of a pricing system for specific roads or zones (e.g. inner city areas)
- Enforcement of fines for vehicles with visible exhaust fumes
- Parking space management in cities through the introduction of parking time restrictions and parking fees
- Parking space removal in cities to reduce people's initiative to access the inner city with cars. Free areas can be used for sidewalks, cycle paths and green infrastructure
- Initiative to reduce idling and motor engine running by installing anti-idling warning signs at idling hotspots and raise awareness by monitoring staff at hotspots
- Quarterly roadside vehicle emissions tests for individual transport within cities

Support of cleaner vehicles

- Optimization of traffic light phases for cyclists and pedestrians
- Pilot project to support the introduction of electric vehicles in urban transport, e.g. for school busses
- Public information campaign to promote cleaner vehicles
- Promotion of air quality beneficial bio-fuels
- Discount on port fees of emission friendly ships

Green infrastructure

- Expanding of green infrastructure such as trees, bushes and grass along streets to remove air pollution at a local scale

In the following boxes, two immediate actions in the transport sector are defined in more detail:

Roadside information on reducing idling and motor engine running

Effect: Reduction of PM and NO_x emissions, supports the reduction of negative health impacts and the reduction of negative impacts on the environment and climate

Character: Information campaign

Target group: Citizens and commercial drivers

In cooperation with: Department of Natural Resources and Environment, Department of Transport, People's Committees of districts and cities, Police

Conditions: Identification of idling hotspots; wardens need to be instructed for patrols; information material has to be prepared

Accompanying measures: Putting up anti-idling warning signs and introduction of an idling restriction and monetary fines for non-compliance

Quarterly roadside vehicle emission tests

Effect: Reduction of PM and NO_x emissions. The measure supports the reduction of negative health impacts and the reduction of negative impacts on the environment and climate

Character: Testing and awareness-raising

Target group: Citizens and commercial drivers

In cooperation with: Department of Natural Resources and Environment, Department of Transport, People's Committees of districts and cities & Police

Conditions: Purchase of portable emission analysers; identification of test sites; police officers or other staff need to be instructed to carry out emission tests; establishment of a system of awareness-raising, incentives and fines

Accompanying measures: Information campaign to promote clean vehicles and fuels

2.3 Domestic activities

Cooking and heating activities in private households as well as small-scale food services, restaurants and hotels can cause severe air pollution, especially when traditional cooking stoves and open fireplaces are used. Burning solid fuels such as wood, charcoal or coal produces hazardous amounts of smoke in homes and other establishments with the direct effect of illnesses and premature deaths in the long-term. Particularly, the more vulnerable groups, i.e. women, children and elderly people, are affected.[18]

In addition to the health impacts, such traditional devices and methods also cause severe environmental and climate impacts through unsustainably produced and harvested solid fuels and the large greenhouse gas production through their burning. Thus, air quality activities targeted at improved cooking and heating technologies, fuels and methods may bring about many co-benefits besides the reduction of emissions, such as improved health, environmental and climate protection, less expenses in the long-term, improved livelihoods, or women's empowerment.

Promising immediate actions can be mainly identified in the field of **awareness-building on the change of cooking and heating technologies, fuels and habits**. Specific staff and **information brokers** can support and promote such activities and therewith increase the acceptance of the need for changes in domestic and commercial habits.

In order to exploit all potential co-benefits, the provincial Departments for Natural Resources and Environment should cooperate and coordinate activities with local women's unions or similar non-governmental organizations.

In the medium- to long-term, such immediate actions should be supplemented by various economic and regulatory instruments at the provincial and national level, in particular taxes or tax deductions and subsidy programs for the replacement or retrofitting of old cooking and heating devices as well as bans and provisions on particularly emission-intensive technologies.

[18] WHO (2018b)

IMMEDIATE ACTIONS FOR DOMESTIC ACTIVITIES

Information and education campaigns and materials for households

- Dissemination of information to encourage the elimination of private charcoal and beehive stoves, e.g. via brochures and radio podcasts
- Dissemination of information material on advanced stoves and boilers and eco-design devices, e.g. via brochures and radio podcasts
- Dissemination of information on the use of air cleaners and air filters in urban pollution hotspots
- Dissemination of information on lighting stoves in an emission-saving way (e.g. wood pellet stoves etc.)
- Voucher campaign for the purchase of clean fuels in cooperation with fuel producers or vendors
- Dissemination of information on clean fuels for households, restaurants and hotels
- Dissemination of information on energy-saving cooking practices for households, restaurants and hotels, e.g. through radio podcasts and brochures
- Award for air quality friendly restaurants and hotels with the most air quality friendly establishments winning a prize, e.g. free advertisement in regional tourism guides

Establishment of entities supporting air quality-friendly heating & cooking

- Establishment of a public office to promote the replacement of emission-intensive cooking and heating technology
- Training of local representatives as information brokers to disseminate information on advanced heating and cooking technologies
- Establishment of a technology watch group at province level keeping track with new clean technologies and fuels for households to regularly update information for citizens

Establishment of Smoke Control Areas

- Pilot project on Smoke Control Areas in densely inhabited urban areas where coal burning in households is regulated

In the following box, one immediate action in the domestic cooking and heating sector is explained in more detail:

Establishment of an office to promote the replacement of emission-intensive cooking and heating technology

Effect: Reduction of $PM_{2,5}$, PM_{10}, carbon monoxide, methane, polycyclic aromatic hydrocarbons, and nitrogen oxide emissions, supports the reduction of negative health impacts and the reduction of negative impacts on the environment and climate

Character: Planning and establishment of administrative-technological infrastructure

Target group: Citizens with a focus on women, households and owners of small businesses

Cooperation with: Department of Natural Resources and Environment, Women union and other similar organizations, Non-governmental organizations

Conditions: New team needs to be employed and instructed; competent authority needs to be determined

Accompanying measures: Awareness raising and information about advanced heating and cooking technology; setting up subsidy programs for devices in cooperation with technology producers and vendors

2.4 Energy and electricity

A major emission source of air pollutants in Vietnam is energy and power generation, especially if it is based on coal-fired power plants. Power production usually leads to the release of large quantities of NO_x, SO_x, TSP, PM_{10}, $PM_{2.5}$, Hg and Cd.[19] According to a study by Amann et al., air pollutant emissions from the power sector will be responsible for the largest increase of $PM_{2.5}$ in Northern Vietnam in the next ten years. AQM activities in these sectors have therefore also the potential to prevent increased future emissions.[20]

Energy and electricity generation and use are cross-sectoral issues. Many air quality management measures related to energy and power are already part of the AQM-activities in other sectors, such as agriculture or domestic activities.

Most measures to reduce emissions from large-scale energy plants are under the responsibility of public authorities at the national level. This, however, should not keep public authorities in provinces and cities from carrying out supplementary activities leading to a more emission-friendly energy production and use within their area of influence. A successful way to reduce emissions from the power sector is the **effective monitoring and enforcement of existing regulations through well-planned and consequent inspections and fines** by public authorities.

Immediate actions in the electricity and power sector being managed by local public authorities further comprise **initiatives for an air quality-friendly heating and cooling of public buildings** and the **support of power generation from renewable energies**.

Although these activities do not lead directly to an immediately measurable reduction of air pollutant emissions, they indeed contribute to a reduced electricity and energy demand which can in turn reduce existing and future emissions by making the one or other new (coal) power plant redundant.

[19] Amann et al. (2019)
[20] Amann et al. (2019)

IMMEDIATE ACTION IN THE ENERGY AND ELECTRICITY SECTOR

Structures for a regular measurement and monitoring of emissions from power generation

- Creation and operation of a task force "Continuous emission monitoring system (CEMS) for power plants" to support the rapid implementation of CEMS technology
- Introduction of regular meetings of the operators of coal power plants and residents
- Creation of a public website giving technical data on mayor point sources from thermal power plants as identified in the emission inventory of the province or city.

Emission reduction plans for industrial plants

- Support voluntary emission reduction plans for power plants for a predefined transition period by giving positive incentives

Heating and cooling of public buildings

- Capacity-building activities about energy-saving measures
- Provincial/city regulation that coal-fired boilers of operating plants must be renovated or modernized
- Energy efficiency standards for the procurement of new heating and cooling systems in public buildings

Support power generation from renewable energies

- Information events on renewable energies and cost savings for local business owners by local energy teams
- Pilot program: Renewable energy for power generation and heating or

Figure: Immediate actions for energy and electricity

In the following box, one immediate action in the energy and power sector is explained in more detail:

Energy efficiency standards for the procurement of new heating and cooling systems in public buildings

Effect: Reduction of carbon monoxide, carbon dioxide and nitrogen oxides emissions

Character: Voluntary commitment of the public sector as good example for further sectors

Target group: Public sector, private sector as those preparing tenders

Cooperation with: Local authorities, Department of Construction

Conditions: Suitable public buildings need to be identified; personnel organizing the procurement needs to be trained; private companies participating in tenders need to be informed

Accompanying measures: Awareness raising and capacity-building within the public and private sector in the province about new energy efficiency requirements in public procurement

2.4 Solid waste management

Rapidly growing cities and an increasing population in combination with an improper disposal of municipal solid wastes entail serious consequences for air quality. According to Tran and Pushkareva (2020), the amount of solid waste in Vietnam doubled in less than 15 years, however, the solid waste management system and its budget could not keep up with this increase in generated waste.[21] Particularly severe for air quality is the burning of waste and the open or improper dumping of waste by people and companies avoiding paying waste collection fees. The burning of waste not only releases large amounts of greenhouse gases but also toxic gases, causing severe health, environmental and climate impacts. But also poorly designed, constructed or maintained landfills and waste treatment facilities contribute to air pollution and the further aforementioned impacts.[22]

The revised Law of Environmental Protection and the National Strategy on integrated solid waste management by 2025 with a vision to 2050 (No. 2149/QD- TTg) set the requirements for the classification, collection, storage, transport, disposal, treatment and recycling of solid waste. However, many provinces, especially the more rural provinces, struggle in meeting the ambitious goals, due to a qualitative and quantitative lack of sufficient disposal, treatment and recycling possibilities. In addition, there is still insufficient knowledge among citizens on the negative impacts of improper waste disposal habits resulting in partly low municipal waste collection coverage (90 – 95% collection municipal solid waste coverage in Hanoi and Ho Chi Minh City, 84-85% in urban areas, 40-55% in rural areas).[23]

Immediate action in the sector is particularly important, as it will take years until a sufficient waste management system including new technological facilities will be in place. Thus, immediate actions should focus on **actions that strengthen the basis for the expansion of a proper solid waste management system by enhancing financial resources and technical capacities**, as well as on **awareness-raising activities among** citizens and **initiatives to close harmful sites**. Although some of these actions will not bring about reductions in air pollutants, they provide the basis for doing so in the long-term.

[21] Duc Tran et al. (2020)
[22] UNEP (2020)
[23] GIZ (2018)

IMMEDIATE ACTION IN SOLID WASTE MANAGEMENT

Support the expansion of proper solid waste management

- Build a team for investigating funding possibilities to fund new waste management treatment plants
- Mandatory training and capacity building on waste management and treatment technologies
- Pilot projects on waste management strategies for remote areas
- Support of alternative solutions for solid waste disposal in remote areas, e.g. through the development of guidelines
- Support of alternative solutions to convert organic waste into biogas to be used in kitchens, for powering vehicles etc.

Information for citizens

- Information campaign on the impacts of burning waste
- Training of local information brokers, who serve as multipliers for information on proper waste disposal

Closure of harmful sites

- Identification and closure of unauthorized and/or harmful dumping sites
- Identification and closure of harmful treatment plants

In the following two boxes, two immediate actions in the waste management sector are explained in more detail.

Taskforce for investigating funding possibilities for the setup of new solid waste treatment plants: Investigation and cooperation initiation on the financing of waste treatment plants, landfills, and recycling plants by international companies, development banks, and funds from waste disposal fees at the provincial level

Effect: No direct emission reduction but supports the reduction of negative health impacts, the reduction of negative impacts on the environment and climate, and the reduction of bad odours if new plants are realized through the financial schemes

Character: Planning

Target group: National and international sponsors

In cooperation with: Department of Natural Resources and Environment, Vietnam Environmental Protection Fund (VEPF), private sector

Conditions: New team needs to be employed and instructed; competent authority needs to be determined

Accompanying measures: Implementation of mandatory waste collection; development of solid waste management plans

Identification and closure of unauthorised and/or harmful dumping sites

Effect: Reduction of volatile organic compounds, ammonium, ammonia, heavy metals, chloride emissions; supports the reduction of negative health impacts, the reduction of negative impacts on the environment and climate, and the reduction of bad odours

Character: Implementation of an existing regulation

Target group: Citizens and operators of dumping sites

In cooperation with: Department of Natural Resources and Environment, Provincial People's Committee, Police & enterprises working in the waste management sector

Conditions: Police officers need to be instructed; equipment and knowledge for covering, eliminating or upgrading the dumping site need to be brought and acquired

Accompanying measures: Awareness raising and information about negative impacts of harmful dumping sites; decree on technical standards for solid waste landfills

2.5 Construction

Available studies suggest that construction sites and activities are important sources of particulate matter emissions, especially PM_{10}. Emissions result from the processing and storage of construction materials, but also from the erection, renovation and demolition of buildings. Construction sites are often located in residential areas. This leads to a high exposure for residents and therewith to comparatively high health risks.[24] The reduction of air pollutant emissions at construction sites is also an important aspect to increase the safety at work for employees and thus to prevent health-related absences.

The revised LEP gives guidelines for environmental protection from construction activities. It provides a legal basis for measures to reduce emissions of dust and other particulate matter from construction. Therefore, many AQM-activities in the construction sector can be carried out immediately, without further regulations needed to be developed.

Suitable immediate actions in the construction sector encompass the **development and dissemination of various guidelines, trainings, workshops and information material for construction managers and workers on various emission-reducing methods and technologies at construction sites**. If necessary, this can be combined with offering advantages for those construction sites applying the methods, e.g. in form of a publication of particularly air quality-friendly construction companies at the public authority's website.

Another area for immediate action in the construction sector is activities supporting the **expansion of green infrastructure in urban areas** and **air quality in buildings**.

Measures in this sector should be closely coordinated with the Department of Construction and the Department of Planning and Investment (DPI).

[24] Kampffmeyer et al. (2016)

IMMEDIATE ACTION IN THE CONSTRUCTION SECTOR

Construction methods reducing emissions

- Information material and workshops for construction site managers and company owners on the enclosure of construction sites to reduce dust
- Training for construction site managers on hardening of the construction site with calcium chloride solutions for dust suppression
- Guide for the environmental-friendly disposal of construction waste for construction site managers and construction company owners
- Information events and workshops for construction site managers on techniques for wet work
- Information material on mechanized construction site cleaning for construction site managers and company owners
- Establishment of an emission control hotline for citizens, enabling citizens to report on strong emission releases from construction sites
- Guidelines for company owners and construction site managers on the reduction of emissions from construction machinery

Improved air quality in buildings

- Guidelines for construction companies, architects and citizens on improved air quality in buildings
- Trainings for architects and architecture companies on building designs for improved air quality

The following box presents one immediate action in more detail:

Training on hardening of construction sites with calcium chloride solutions

Effect: Reduction of dust emissions; supports the increase in health of construction workers and surrounding residents

Character: Education

Target group: Construction site operators and construction workers

In cooperation with: DONRE, Department of Construction and/or the Department of Planning and Investment (DPI)

Conditions: Hire staff which carries out the training workshops; identify funding possibilities to offer the training at low cost or for free

Accompanying measures: Create and disseminate information material on further dust suppressing measures; initiate a subsidy program for emission and dust reducing devices

2.6 Agriculture

Emissions from the agricultural sector in Vietnam mostly result from two main sources: The burning of crop residues and open storage of manure. But also the use of fertilizers is a large source of air pollutants. Among the two, crop residue burning is responsible for emissions of PM_{10}, $PM_{2.5}$, CO, CO_2, SO_2, NOx, NH_3, CH_2, while open manure storage results in emissions of CO_2, N_2O and NH_{4+} In absolute quantities, it seems that crop residue burning is responsible for more emissions than other agricultural practices[25].

The revised LEP gives guidelines for environmental protection, including emission reduction from agricultural activities. It ensures that AQM-activities in the agricultural sector can be carried out immediately without the development of further regulations. For example, the LEP explicitly prohibits crop residue burning near airports, residential areas and major traffic routes.

The revised LEP also determines that for the implementation of most of the AQM-activities in agricultural production, the Ministry of Agriculture and Rural Development is the main responsible entity. Immediate actions aiming at the agricultural sector at provincial level should therefore be planned and carried out in **close coordination with the local Department of Agriculture and Rural Development (DARD).** Joint AQM-initiatives do not only make the best use of expertise and networks from both departments but also support the optimal use of co-benefits and synergies.

IMMEDIATE ACTIONS IN THE AGRICULTURAL SECTOR

Reduction of crop residue burning

- Organization and implementation of regulated, scheduled crop residue burning
- Information events about hazards of crop residue burning

Support of alternative uses of crop residues

- Pilot project of bio-char production as alternative to crop residue burning
- Information events and courses about alternative uses of agricultural residues
- Pilot project for the installation of small-scale biogas plants in farm households and small livestock operations as alternative to crop residue burning

Expanding manure covering practices

- Information events about manure covering for local farmers
- Province-wide requirement to cover outside storage areas for manure/slurry with foil or comparable technology

Expanding manure covering practices

- Workshops and information material about the right use of emission-friendly fertilizers

[25] UBA (2020c)

Immediate actions in the agricultural sector comprise awareness-raising and educational measures about crop residue burning and manure covering practices for farmers. It is crucial that restrictions on the burning of crop residues are accompanied by pilot projects, information and educative measures presenting farmers **alternative uses for their crop residues.**

In the following box, you find a drafted pilot project supporting an alternative use of crop residues for farmers.

Pilot project for the installation of small-scale biogas plants in farm households and small livestock operations as alternative to crop residue burning

Effect: Reduction of a large variety of air pollutant emissions, support of alternative uses of crop residues and therewith income-generation for farmers

Character: Pilot project

Target group: Local farmers

In cooperation with: Local Department of Agriculture and Rural Development (DARD)

Conditions: Joint task force with DARD to plan, prepare, coordinate and implement the pilot project and to identify possible funding, and suitable stakeholders.

Accompanying measures: Information events for farmers/rural households about advantages of small-scale biogas plants and options for finance.

3. Health protection measures for immediate action

The drafting of an emergency plan to protect the population from severe health impacts in case of extreme air pollution is by far the most important immediate action in the area of health protection. However, **the preparation and coordination of an emergency plan for health might fall under the responsibility of the local Department of Health (DOH). Nevertheless, it is suggested for local DONREs to take the first step and contact the local DOH to propose the joint development and/or regular joint update of this emergency plan,** and to support the local DOHs with existing data and knowledge (such as e.g. the emission inventory).

In general, an emergency plan for serious air pollution includes actions and measures for a quick reduction of emissions and measures for health protection after emissions are released.

An emergency plan needs to define the responsibilities among different departments and other actors to implement and to inform the public about each measure, as well as modes of cooperation and coordination of the responsible entities. It is therefore important to include all necessary stakeholders into the development process of the emergency plan for severe air pollution.

Many emergency measures for a quick emission reduction can be found the **AQMA-table** and within sectoral immediate actions. Therefore, we focus in this chapter on the emergency plan for health protection measures, which should ideally be **coordinated by the local Department of Health**.

IMMEDIATE ACTION FOR HEALTH PROTECTION

Draft and coordinate an emergency plan for health protection with other resorts of the city or province

Actions and measures which might be included in such an emergency plan are:

- Distribute information about severe air pollution and most severely polluted areas among citizens
- Distribute information about health-protecting measures for individuals, e.g.
  - to keep windows closed
  - to cancel outdoor sports and activities
  - to wear suitable masks
- Distribute information about health protecting measures for sensitive groups (and their caretakers)
- Prepare, implement and inform stakeholders about the suspension of kindergarten and school classes, and alternative teaching methods
- Distribute information about health protecting measures for sensitive groups (and their caretakers)
- Implement and enforce the suspension of exhausting outdoor works (e.g. construction works)
- Organize of more regular, mechanized cleaning of roads and the sprinkling of water on roads.

Further immediate actions for Health Protection:

- Training of local general practitioners about air pollution related illnesses, cures and counter measures

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