

Air Pollution Series

Guide on Ambient Air Quality Legislation



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Air Pollution Series: Guide on Ambient Air Quality Legislation

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This Guide deals with a fast-moving field, and the subject matter may become dated quickly. Readers are advised to check the main sources cited for updates and new materials. However, UNEP considers the fundamentals of air quality governance as discussed in this Guide to be more durable and likely to remain relevant in the immediate future.

List of abbreviations and acronyms

AAQS	Ambient air quality standards
AQI	Air quality index
Aarhus Convention	UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (1998)
CAFE Directive	Directive 2008/50 of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe
CJEU	Court of Justice of the European Union
CLRTAP	Convention on Long-Range Transboundary Air Pollution (1979)
CO	Carbon monoxide
EU	European Union
GAAPL	Regulating Air Quality: The First Global Assessment of Air Pollution Legislation (UNEP 2021a)
Montevideo V	Fifth Montevideo Programme for the Development and Periodic Review of Environmental Law
NO₂	Nitrogen dioxide
NO_x	Nitrogen oxides (the sum of nitric oxide and nitrogen dioxide)
NMI	National Metrology Institutes
O₃	Ozone
PM_{2.5}	Particulate matter, fine inhalable particles, with diameters that are 2.5 micrometres and smaller
PM₁₀	Particulate matter, fine inhalable particles, with diameters that are 10 micrometres and smaller
SO₂	Sulfur dioxide
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNGA	United Nations General Assembly
WHO	World Health Organization
WHO AQGs	World Health Organization Global Air Quality Guidelines (WHO 2021)
WMO	World Meteorological Organization

Glossary

Ambient air	Outdoor air that is well-mixed in outdoor environments only, which might reasonably be encountered by a member of the general public in day-to-day life. This is distinct from air that an individual may encounter through occupational activities or air that is very close to a point source of emissions.
Ambient air quality standard	A value set for a minimum acceptable quality of ambient outdoor air, referenced as a measured mass concentration (e.g. units of micrograms per cubic metre), mixing ratio or mole fraction (e.g. expressed for example as parts per billion, nanomoles per mole), of a specified pollutant or group of pollutants.
Legislation	Legislation includes all laws and regulations established by any formal state-sponsored legislative process, in accordance with the constitutional structure and norms of the relevant country.
Primary legislation	Legislation enacted by a parliament or legislature, where political choices are formalized through law-making in line with constitutional conventions or requirements, including Acts, statutes and European Union legislative acts (such as European Union directives).
Secondary legislation	Legislation developed under powers prescribed in primary legislation or otherwise lawfully issued by a government or other empowered executive authority, with or without some parliamentary oversight, including regulations, subordinate legislation, directions, orders, etc.
Primary pollutants	Pollutants that are emitted directly from anthropogenic sources, such as from a chimney, tailpipe or stove. Typical primary pollutants include particulate matter, nitrogen oxides, and sulfur dioxide.
Secondary pollutants	Pollutants that are formed in the atmosphere through chemical reactions, such as ozone.

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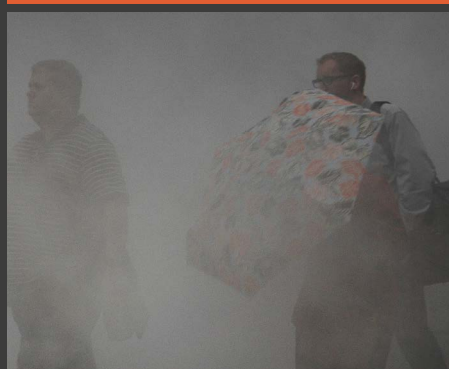
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Foreword

Air pollution today remains one of the greatest environmental threats to human health worldwide and is estimated to have caused 4.2 million premature deaths globally in 2016. Beyond its devastating health impacts, air pollution has strong linkages to ecosystem degradation and climate change, as well as potential connections with exacerbating vulnerability to COVID-19. Women and girls bear the brunt of these far-reaching impacts.

In a historic decision in July 2022, the United Nations General Assembly (UNGA) declared the universal human right to a clean, healthy and sustainable environment (UNGA 2022a). The resolution explicitly recognized air pollution as contributing to the interference of the enjoyment of a clean, healthy and sustainable environment. This recognition is expected to go a long way in encouraging policymakers to take stronger action against pollution, as well as in enabling those impacted to hold governments to account where there is failure to adequately do so. Importantly, the resolution raises the visibility of the seriousness of the air pollution problem and its intrinsic link to human life and environmental sustainability.

Embedding ambient air quality standards (AAQS) in legislation is an important foundation for effective national air quality governance. Legislation can establish institutional responsibility for air quality standards, set mechanisms for accountability, public participation and enforcement, and institutionalize processes for setting and updating robust air quality standards as knowledge and technologies develop. UNEP's 2021 **Regulating Air Quality: The First Global Assessment of Air Pollution Legislation** found that, while most countries in the world do embed AAQS in legislation, there was no common legal framework for AAQS globally. In many countries, legislative provisions defining the purpose and scope of national air quality laws, establishing institutional responsibility to implement and enforce AAQS, and enabling public participation and access to justice, among other effects, were weak or did not exist. Coupled with these findings, a key message emerging from the 2022 International Day of Clean Air for Blue Skies underscored that, while

government actions on air quality are increasing, implementation and capacity gaps continue to pose challenges to effectively improving air quality.

Considering these developments, UNEP has developed this **Guide on Ambient Air Quality Legislation**. The Guide is for countries seeking to develop or improve ambient air quality legislation, and ultimately aims to promote robust national systems of air quality governance that prioritize public health outcomes and respect that all humans share the same need to breathe air of adequate quality. The Guide emphasizes that air pollution is a collective problem arising from decisions and behaviours across a wide range of policy sectors. Thus, regulatory alignment across wide-ranging policy areas is critical to achieving AAQS in practice.

Under the Fifth Montevideo Programme for the Development and Periodic Review of Environmental Law, national focal points representing countries worldwide identified air pollution as an initial priority area for implementation. UNEP has been working with countries to provide technical legal support and develop knowledge and capacity-building skills and tools, such as this Guide, to support them in their efforts to improve air quality at the national, regional and international levels. UNEP will continue to support countries in developing legal responses to air pollution that leave no one behind, recognizing that addressing air quality is not only fundamental to improving human health and well-being for both women and men, but also to addressing the triple planetary crisis of climate change, biodiversity loss and pollution.



PKameri

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Executive summary



Executive summary

The overall composition and quality of the air people breathe in the outdoor environment – and, by extension, often also in indoor environments – is strongly influenced by legal standards and mandates for air quality policy development. Institutionalizing good air quality outcomes, particularly to support the attainment of the values of the 2021 World Health Organization Global Air Quality Guidelines (WHO AQGs), thus requires well-designed national legal frameworks.

This Guide on Ambient Air Quality Legislation is designed to assist national lawmakers and policymakers in developing or improving ambient air quality legislation, with the aim of promoting robust national systems of air quality governance that prioritize public health outcomes, respecting that all humans share the same need to breathe air of adequate quality. This Guide addresses a lacuna that exists in air quality laws globally, providing a legal resource for developing robust national legislation that supports public access to scientifically evidenced levels of clean air.

In this Guide, ambient air quality standards (AAQS) embedded in legislation are the centerpiece of wider legal, regulatory and policy frameworks for delivering improvements in air quality. AAQS are not self-executing; they must be legally constructed within national systems. The Guide explains how AAQS should be embedded within a comprehensive legal architecture, including monitoring, accountability and policy coordination obligations, which holistically constitutes a robust system of air quality governance.

The role and potential of AAQS for health protection have come to the fore in recent years through public interest litigation. Procedural environmental rights have risen globally and courts across the world are now more

frequently asked to assess issues related to AAQS, their meaning and their legal consequences. Through advances of case law, well-constructed air quality laws are increasingly foundations of enforceable air quality schemes, promoting public health for all.

AAQS, framed as concentration-based limits, are not the only regulatory solution for addressing air quality. As a singular regulatory approach, they risk sanctioning pollution as admissible within a given prescribed level. The level of ambition of AAQS is thus very important, including processes for moving towards a higher level of ambition over time, as is developing complementary standards and supportive regulatory and policy approaches to work towards genuinely healthy levels of clean air for all.

This Guide does not recommend model legal provisions to be adopted by all countries. Rather, it outlines a list of interdependent core legislative elements that together constitute a robust system of air quality governance, presenting these through a series of questions and issues that lawmakers should consider when creating or updating air quality laws. These elements are based upon observations of existing frameworks across the world, recent case law developments and the latest scientific knowledge. Relevant legal issues are also proposed as a checklist for lawmakers and stakeholders to use in reviewing processes and proposals for creating or updating air quality legislation. How these issues are relevant and addressed within different countries will depend on their national legal, political and environmental circumstances.

The Guide's comprehensive legal approach should be broadly applicable to both primary and secondary pollutants.



Air quality legislation checklist

After comprehensive research on the state of air national quality laws globally, published in UNEP's 2021 **Regulating Air Quality: The First Global Assessment of Air Pollution Legislation**, this Guide translates the key findings of that research into a concrete set of questions and key considerations for national lawmakers. This checklist summarizes those questions and considerations. The checklist is not a prescription or blueprint for what should be contained in new or revised legislation that sets or implements AAQS. Rather, it should be used as a prompt to identify and highlight gaps in existing legislative provisions or capabilities for ambitious air quality governance; to give guidance on specific matters to be considered in developing or amending legislation for clean air; and to create awareness of

areas where further expertise may need to be sought in the development and implementation of AAQS.

Under each checklist point, there is a short statement of issues to consider. These statements relate to more detailed commentary under the relevant sections of the Guide (as noted in each heading), which should be consulted for more complete guidance. Please also use the table of contents to locate the relevant subsections for more information on each of the points raised in the checklist.

In using the checklist, it is also important to read the Guide's introduction below to obtain a clear sense of the Guide's scope and rationale, and how it should be used and applied in national contexts.

NATIONAL CONTEXT

(Introduction)



Does your country have a constitutional or wider legal framework that will influence the interpretation of national air quality legislation?

This may include constitutional rights to life, health, a clean, healthy and sustainable environment, and so on, and national doctrines of public law, which may affect the interpretation of, or required content of, national air quality laws.

Is your national air quality law currently under review, or are there legal, scientific or public health grounds for reviewing national air quality legislation?

If national air quality legislation is under review, this presents an opportunity to reform air quality laws to improve their ambition and effectiveness, in accordance with this Guide. Equally, in many countries, the WHO AQGs provide a case for undertaking such a review.

What are the main emission sources that contribute to air pollution in your country and who/what is affected?

Consider whether you have a reliable national inventory on air emissions that is resolved both spatially and by pollutant type, as well as data on population exposure and which ecosystems are affected by air pollution. This data will influence which sectors, industries or pollutants are prioritized for legal control, and whether specific locations, susceptible groups or particular types of ecosystem are identified as requiring specific protection.



NATIONAL CONTEXT

(Introduction)

Is there relevant case law from courts or relevant tribunals supporting or affecting the interpretation of your national air quality legislation?

This is particularly important in appraising how enforceable legislative instruments (containing AAQS and related requirements) are or may be within national legal systems.

What cost and capacity constraints affect national air quality governance in your country?

Constraints may include limitations on capacity of administrative and scientific structures to provide support for air quality regimes, budgetary pressures (at government or individual household level), and limited capacity across relevant government departments to implement air quality policy. Countries with severely limited capacity to develop legislation or implement legislation may be able to request UNEP support.



INTERNATIONAL CONTEXT

(Guide, section 2)

Are there international legal obligations for the adoption of AAQS or relating to air quality governance that apply to your country?

These include regional treaties, such as the Convention on Long-Range Transboundary Air Pollution, or soft law agreements such as the Southern African Development Community Regional Policy Framework on Air Pollution.

Are there other applicable international obligations relating to air quality governance that are relevant to your country?

These include obligations to monitor transboundary air pollution and to exchange information with other countries, and may be found in international treaties or soft law agreements. These also include international obligations relating to procedural environmental rights.

Have you considered how the WHO AQGs values relate to your national air quality laws?

The 2021 AQGs, issued in September 2021, are foundational to air quality law and policy. They provide an opportunity for reviewing national air quality laws according to the latest scientific research, outlining levels of ambition for air quality standards that are implemented through national legal frameworks.

4 This is based on the understanding that adaptive capacity is a function of the amount, diversity and distribution of human, social, physical, natural and financial capital (Ensor and Berger 2009; Ayers *et al.* 2012; as cited in Reid *et al.* 2019).

FOUNDATIONS OF NATIONAL AIR QUALITY LAWS: LEGISLATIVE PURPOSE, SCIENTIFIC KNOWLEDGE, PROCESS AND SCOPE (Guide, section 3)



Are AAQS set within a legislative instrument, at national or subnational level?

AAQS should be prescribed in a legislative instrument, or across a range of connected legislative instruments, in order to establish legal certainty for economic operators, and to embed AAQS within a wider legal structure setting out levels of ambition, processes of enforcement and accountability, and citizen rights and obligations.

What should be the purpose(s) of air quality legislation?

A contemporary legislative regime for air quality should pursue the purpose of achieving clean air for public health as a primary objective (alongside other environmental protection goals, such as the protection of vegetation and ecosystems), aligning that legislative framework with national and international public health goals, drawing on evidence from sources such as WHO.

Does your country's air quality legislation currently take the latest scientific and technical knowledge about air pollution into account?

Taking into account scientific and technical expertise may be explicitly required by legislative processes for setting AAQS, by processes for reviewing them, or may inform air quality law-making in other ways. National lawmakers using the Guide should ensure they are liaising with appropriate teams across government, or relevant external experts, where key issues lie outside their direct expertise and, in particular, with scientific and technical teams.

Which level of government should adopt AAQS?

Adoption of AAQS by central or federal governments is consistent with providing equitable standards for all. For some geographically large countries, differentiation of standards at provincial, regional or other subnational levels may be appropriate if there are divergent environmental conditions. Adoption of AAQS by local governments alone is not generally a feasible approach for pollutants such as O₃ or PM_{2.5} that have atmospheric residence times of days to weeks.

What type of legislation is adopted to establish AAQS?

AAQS may be promulgated by or under environmental or sector-specific primary legislation, by secondary legislation, or may be established using a combination of legislative measures. Whichever type of legislation is adopted to introduce AAQS, it will need to balance considerations of expediency and democratic oversight and ensure that, within the relevant political and legal culture, the integrity of the whole system of air quality governance is carefully constructed and maintained.

FOUNDATIONS OF NATIONAL AIR QUALITY LAWS:
 LEGISLATIVE PURPOSE, SCIENTIFIC KNOWLEDGE, PROCESS AND SCOPE
 (Guide, section 3)



How are the views of stakeholders and the public, including communities disproportionately impacted by air pollution, included in the process of setting AAQS?

In line with global norms of environmental democracy (**section 7**), to allow for meaningful participation, any relevant interested party should be informed of the opportunity to participate in any process to develop new AAQS and should be entitled to submit their opinion. This should be based on a proposal on AAQS that is publicly available and widely circulated, which should allow sufficient time for detailed consideration of the proposed AAQS.

If AAQS are not found in primary legislation, but are authorized to be introduced through secondary legislation, is there a deadline to ensure that AAQS are introduced in regulations within a reasonable time?

If AAQS are not directly prescribed in primary legislation, a reasonable deadline for introducing AAQS is sensible, to ensure that the AAQS are in fact set while building in adequate time for public consultation.

Is an identifiable and explicit purpose included in your country's AAQS legislative framework?

Objectives of air quality law should be suitably located within a country's legislative framework and express adequate ambition in order to support a holistic and effective national air quality regime, including through influencing interpretation of the regime.

What factors are considered in designing the scope of national air quality laws?

Issues of scope are fundamental to ensuring that all relevant pollutants and forms of pollution are covered by AAQS or otherwise addressed by national air quality regulation, including pollution arising from hazardous natural events and transboundary sources. In addition, all citizens should be protected from polluted air, avoiding "sacrifice zones".

Are women and vulnerable populations specifically taken into account in your country's air quality laws?

Lawmakers should consider whether air quality regimes adequately address the protection of women and men, as well as sensitive and disadvantaged populations, including providing for special duties in this regard. For example, areas might be identified for enhanced monitoring and management where there are vulnerable populations at risk.

SETTING LEGISLATIVE QUALITY STANDARDS FOR AMBIENT AIR

(Guide, section 4)



Are your country's AAQS based on WHO guideline values?

The WHO AQGs provide a well-evidenced starting point for national evaluation of AAQS, which will also need to take into account national environmental and social conditions. They also provide a lower limit, beneath which it is likely only modest further health benefits would accrue. At the same time, consistency of AAQS with AQGs is a stepwise process in many countries, and the WHO interim guideline values may be important staging posts in setting AAQS.

Have you considered other kinds of air quality standards, in addition to concentration-based AAQS?

In light of possible policy and gaming risks when relying only on concentration-based limits, countries may consider additional forms of air quality standards to support public health goals. Other approaches to standards setting for air quality include the adoption of targets for continuous improvement, or limits on overall population exposure.

Have you taken into account vulnerable populations in setting AAQS?

The level of ambition in setting AAQS should account for the vulnerabilities of certain groups, as well as continuous exposure, and ensure adequate standards are set for all.

Have you adequately considered key technical aspects of setting AAQS?

It is important to adopt suitable time averaging periods consistent with the public health goals of air quality regimes, and to ensure that any allowed exceedances have evidence-backed scientific rationales. AAQS should also include transparent definitions associated with monitoring measurements to support users when comparing the standards as written with the observations against which they are being compared.

Are there legislative processes for reviewing AAQS over time?

Regular review processes for legislative AAQS, supported by adequate data and stakeholder input, are important to take account of evolving scientific knowledge, and should be designed into legislative schemes to ensure they support ambitious public health objectives. In some legal systems, such review may happen through issuing new regulations or other secondary legislation mechanisms.



ADMINISTRATIVE FRAMEWORKS FOR COMPLIANCE WITH LEGISLATIVE AAQS: MONITORING, DATA AND ZONING

(Guide, section 5)

Do your country's laws have adequate legal requirements to monitor air quality?

Physical monitoring is required to identify potential breaches of an AAQS. Setting a monitoring requirement in law ensures this critical element of air quality governance is embedded within air quality regimes. Overall, the Guide recommends that lawmakers consider setting out detailed specifications in constructing legal monitoring requirements to ensure useful data is procured to underpin an effective air quality regime, and that those responsible for delivering the monitoring regime can be held to account.

Is there a clear delineation of government responsibility for monitoring?

Particularly in countries with federal or devolved systems of government, there should be a clear delineation of which level of government is responsible for air quality monitoring, and how this obligation links coherently to obligations to collate and disseminate data, and to achieve AAQS or otherwise improve air quality.

Are location requirements for monitoring air quality well framed to support robust data collection?

The representativeness and usefulness of monitoring data will depend on how representative monitoring stations are of population exposure. Their number and locations will be particularly important, and legislative frameworks can prescribe location requirements to ensure that monitoring is robust.

Is there scientific and public confidence in air pollution data used for compliance?

The quality of data used to assess compliance with AAQS is crucial for air quality regimes to operate effectively. Measurements should be open to scrutiny and deliver data that show transparently whether predefined data quality standards are being met, as well as being traceable to appropriate basic metrological units, ideally made with international equivalence.

Is air quality modelling being appropriately used to support air quality monitoring?

While air quality modelling is not currently considered suitable as the primary method for evaluating compliance with AAQS in regions where there is a substantial risk of exceedance, it provides a means to estimate air quality in locations that are not monitored and provides a valuable resource for the development of policy and for public information.

Is there a role for citizen science, academic institutions or other actors in supporting monitoring?

Citizen science is valuable for empowering individuals and community organizations to measure air quality in their own neighbourhoods and alerting authorities to local issues. Collaboration between government, universities, United Nations entities, foreign embassies and community groups may also provide a pragmatic approach to delivering measurements that inform all parties on progress towards attainment of AAQS.

How is zoning being used to support air quality management?

Zoning can be a useful regulatory tool for air quality monitoring and management, so long as zoning for management of high pollution areas is accompanied by regulatory powers adequate to managing the problem identified.

COMPLIANCE AND ENFORCEMENT MEASURES

(Guide, section 6)



State responsibility for meeting AAQS

Is there direct legal responsibility on the government to achieve AAQS?

Due to the collective nature of ambient air pollution problems, the strongest form of legal accountability for achieving AAQS is a binding legislative obligation on the state to achieve air quality standards, either immediately or within a specified time frame consistent with the purpose of the legislation. The precise drafting of such an obligation will be critical to its effectiveness as a basis for legal enforcement of national legislative AAQS.

Do your country's air quality laws primarily impose liability or duties on individual polluters where non-compliance with AAQS has been established?

Individualized obligations are useful in alerting high polluting industries to the contributions in relation to AAQS; however, they do not capture the collective nature of ambient air pollution problems, which generally arise from combined primary and secondary sources. Countries should review whether any such obligations are adequately supported by obligations on the state to achieve AAQS, either immediately or by a given deadline consistent with the purpose of the legislation.

Where there is non-compliance with AAQS, is there a duty on the government to develop plans to achieve compliance?

Another potentially effective legal consequence for breaches of AAQS are obligations on the state to plan to meet AAQS, requiring governments to set up a dedicated administrative process to tackle air pollution problems. The precise construction of planning obligations will impact how effective they are, in addition to resources and political will needed to support such planning processes.

<p>Are there legal obligations on government to take emergency action when air pollution reaches, or is likely to reach, a particularly high concentration threshold?</p>	<p>Emergency planning obligations when air quality reaches hazardous concentrations are important to compel the government to act when there is imminent harm to vulnerable populations.</p>
<p>Where there is non-compliance with AAQS, are there reporting obligations to an official body?</p>	<p>The requirement to report on breaches of AAQS to an official body, such as a government agency or parliament, can be a powerful regulatory device to hold governments to account through political means and through transparency to the public.</p>
<p>Enforcement and sanctions for breaching air quality law</p>	
<p>Are air quality laws drafted in such a way that they are enforceable?</p>	<p>All legislative provisions in a system of air quality governance should entail clear legal obligations, including what is required to be done, who is required to perform the relevant obligation, and by what deadline this obligation needs to be performed or achieved.</p>
<p>Are there effective avenues for legal enforcement of AAQS in your country's legal system?</p>	<p>Countries should review their general constitutional and public law doctrines and any specific enforcement mechanisms within applicable air quality regimes to determine whether there are adequate avenues for the effective legal enforcement of AAQS, supported by judicial intervention as required. Where this involves legal enforcement against the government, this is more easily facilitated in systems of multilevel governance, or where there are strong traditions of constitutional rights or <i>actio popularis</i>.</p>

PROCEDURAL RIGHTS FOR AMBIENT AIR QUALITY

(Guide, section 7)



Is AAQS legislation publicly available?

To comply with international norms of environmental democracy, legislation promulgating AAQS and setting up administrative mechanisms to institutionalize these standards should be publicly and readily available, published in any official gazette or journal, and be accessible for free. In addition, arrangements should be made to ensure that vulnerable groups with specific barriers relating to access to information can access these legislative standards.

Are air quality monitoring results required to be disseminated to the public?

To comply with international norms of environmental democracy, air quality regimes should include an obligation to disseminate monitoring results, both passively (for example on a website) and actively (on demand), and on a sufficiently regular basis to allow the public to be aware of immediate risks to health.

Does the public have rights to participate in the adoption and revision of AAQS?

To comply with international norms of environmental democracy, air quality regimes should include rights for the public, including marginalized groups, to participate in the adoption and revision of AAQS, whether through general rights of public participation in developing new laws or rights specific to the development of legislative AAQS.

Does the public have rights to participate in air quality management planning?

To comply with international norms of environmental democracy, air quality regimes should include rights for the public, including marginalized groups, to participate in air quality management planning, whether in general legislation or in specific legislation on air quality.

Are there rights of access to justice in relation to air quality legislation?

To comply with international norms of environmental democracy, air quality regimes should be supplemented by rights of access to justice. Considering the diffuse nature of air pollution and the widespread harms it causes, it is important to provide access not only to direct victims of air pollution, but also to potential guardians of air quality, such as non-governmental organizations.

COORDINATING AIR QUALITY GOVERNANCE

(Guide, section 8)



Are there mechanisms to coordinate different legal tools of air quality control?

Other approaches to regulating air quality should be coordinated with AAQS regimes to ensure mutually supporting implementation, and to maximize administrative efficiencies.

Are there legal obligations to coordinate government policymaking, or share public duties, in relation to AAQS?

Since government action across wide-ranging policy areas is critical to achieving AAQS in practice, legislative provisions might require coordination of government policymaking or regulatory authority in relation to the attainment of AAQS. The Guide strongly recommends that such provisions are considered and adopted, both horizontally and vertically, including duty-sharing across public authorities, as appropriate to the governmental structures within the relevant country.

Have you considered the impact of other government policies (i.e. not directly related to air quality) on the attainment of AAQS?

It is important to ensure that other policies developed by government do not undermine the attainment of AAQS. In particular, climate change, public health and air quality policies should be coordinated and mutually reinforcing. Legislative obligations on government to achieve AAQS can inform such holistic policymaking.

Are there effective ways of coordinating legal AAQS with sectoral regulation of individual pollution sources?

Establishing AAQS is only a first step that will require mutually supporting decisions on point source control. Sectoral regulatory schemes should take into account AAQS in authorizing individual projects, particularly in relation to industrial permitting and urban planning decisions. Any such consideration should take into account the cumulative impact of individual decisions in relation to air quality.

Introduction

Providing a legal resource for developing robust national ambient air quality legislation

1



Introduction

Providing a legal resource for developing robust national ambient air quality legislation

This Guide addresses a lacuna that exists in air quality laws globally – providing a legal resource for developing robust national ambient air quality legislation that supports public access to scientifically evidenced levels of clean air. Indoor and outdoor air pollution is “among the leading avoidable causes of diseases and death globally, and the world’s largest single environmental health risk”. It is also “a cause of global health inequities, affecting in particular women, children and old persons, as well as low-income populations” (World Health Organization [WHO] 2015). Effectively addressing air pollution is a key component of achieving Sustainable Development Goals 3, 11 and 12. For those countries with currently high emissions and/or concentrations of air pollution, legal frameworks for phased improvement of air quality will be important for institutionalizing and embedding a trajectory of continuous improvement over time. National air quality laws are one of the “key institutional tools” to facilitate such progress (WHO 2021, xxi).

Following comprehensive research on the state of air national quality laws globally, published in the United Nations Environment Programme (UNEP)’s 2021 *Regulating Air Quality: The First Global Assessment of Air Pollution Legislation (GAAPL)*, this Guide translates the key findings of that research into a concrete set of questions and key considerations for national lawmakers. Key findings of that research included that only 64 per cent of countries embed ambient air quality standards (AAQS) in legislation, although many countries are in the process of revising air quality legislation; 43 per cent do not have a legal definition of “air pollution”; air quality monitoring is not a legal requirement in at least 37 per cent of countries; only a third of countries have obligations on the state to

implement and/or achieve legislatively mandated ambient air quality standards, in spite of the state’s key role in coordinating the control of these diverse and dispersed sources of air pollution; and only a third of the countries studied have legal mechanisms for managing or addressing transboundary air, although air pollution knows no borders (UNEP 2021a, 7). Overall, the research pointed to lack of enforcement capacity as a key reason for the poor implementation of air quality law.

In addressing these and other technical legal issues, the Guide is fundamentally premised on globally agreed public health goals, as set out in the WHO AQGs, respecting the fact that all humans share the same need to breathe an air of adequate quality. The WHO AQGs are intended to influence lawmakers and provide a strong, evidence-based global signal about the degree of protection that should be embedded in national air quality laws in relation to certain key pollutants, including through interim targets where appropriate; but they are not self-executing, and require effective implementation through, inter alia, national legal structures.

The Guide is also holistic, highlighting that air pollution is a complex sociopolitical problem that requires a multifaceted and well-coordinated legal response. The Guide’s comprehensive legal approach should be broadly applicable to both primary pollutants such as particulate matter, nitrogen oxides and sulfur dioxide (which are emitted directly from anthropogenic sources), or secondary pollutants such as ozone (which are formed in the atmosphere through chemical reactions).

Purpose of the Guide

The Guide aims to assist national lawmakers and policymakers in developing or strengthening ambient air quality legislation, with the aim of promoting robust national systems of air quality governance that prioritize public health outcomes. It identifies the most relevant legal issues for national lawmakers and policymakers to consider in designing and reviewing air quality legislative frameworks, presenting these in the form of a checklist at the beginning of the Guide and further elaborating on these issues within the Guide.

While the Guide outlines a range of legal issues to consider for embedding ambitious air quality control, the Guide is not recommending model legal provisions to be adopted by all countries. This is because the legal situations of countries across the world vary widely, in terms of the current state and structure of air quality legislation, and in terms of national legal and political contexts for reforming air quality law. Instead, the Guide provides legislative examples where possible to illustrate the treatment of key issues. Furthermore, the WHO AQGs on particulate matter (PM), ozone (O₃), nitrogen dioxide (NO₂), sulfur dioxide (SO₂) and carbon monoxide (CO) acknowledge that countries will be in very different positions in relation to air pollution problems. Some will have high concentrations of pollution that are challenging to address; others may have no significant air pollution problems. Some may experience air pollution from natural events such as forest fires or dust storms; others may find that much of their ambient outdoor pollution derives from sources upwind and outside of their direct national control, often referred to as “transboundary pollution”. These circumstances will be relevant in reviewing legal frameworks, and policy measures that implement or support them. For those countries with currently high emissions and/or concentrations of air pollution, legal frameworks for phased improvement of air quality will likely be important for institutionalizing and embedding a trajectory of continuous improvement over time. Legal frameworks are one of the “key institutional tools” to facilitate such progress (WHO 2021, xxi).

The Guide was prepared under the roadmap to deliver the initial priority area for implementation of UNEP’s Fifth Programme for the Development and Periodic Review of Environmental Law (Montevideo Programme V), namely legal responses to address the air pollution crisis (UNEP 2022b, annex II).

The Guide draws on UNEP’s 2021 research surveying national air quality legislation around the world (GAAPL) and on technical expertise of contributing consultants and expert consultees, on ambient air quality monitoring and modelling in particular (see annex). As noted above, it is also inspired by the most recent WHO AQGs, as published in 2021.

Developing a robust system of air quality governance through air quality law

Embedding policy ambition for clean air in national legal frameworks requires paying attention to the entire legal regime relating to air quality. As noted above, bare legal standards for air quality – even if ambitious – are not self-executing and the wider legal architecture is critical to institutionalising and enforcing standards for clean air.

As outlined in the GAAPL, a robust system of air quality governance to deliver public health outcomes is one which:

- 1. requires governments to develop and regularly review applicable air quality standards in light of public health objectives;**
- 2. determines institutional responsibility for those standards;**
- 3. monitors compliance with air quality standards in a manner that is consistent, scientifically robust and broadly representative of population exposure;**
- 4. defines consequences for failure to meet air quality standards;**
- 5. supports the implementation of air quality standards with appropriate and coordinated air quality plans, regulatory measures and administrative capacity; and**
- 6. is transparent and participatory.**

Figure 1. Air quality governance system founded in legislation. Source: UNEP 2021a, 13



Figure 1 illustrates such a holistic domestic system of air quality governance (GAAPL, Introduction).

This conceptual map of air quality law shows the range of matters to consider in developing a robust system of air quality governance to embed and deliver AAQS, from overall air quality objectives and review mechanisms for air quality standards, to legal mechanisms for institutional responsibility and rights of the public. An example of a country’s air quality law that is designed around this kind of approach is seen in South Africa’s 2004 Air Quality Act.

As the Guide is concerned with globally relevant legal issues for designing robust systems of ambient air quality governance, it addresses the elements

outlined in Figure 1 that are or should be contained as **core elements** of national legislative regimes that implement AAQS. Other elements in Figure 1 (such as any constitutional guarantees) are beyond the scope of the Guide, but should be addressed as key contextual factors affecting how the Guide should be employed in specific national contexts, as explained further below.

Overall, this approach shows that designing robust air quality governance requires accountable, evidence-based standard setting; institutional capacity, resources and responsibility; policy and regulatory coordination; inclusive processes; and access to information and justice where public health is compromised.



South Africa

National Environmental Management: Air Quality Act 2004

Chapter 2

Part 1: National framework

Article 7. Establishment

(1) *The Minister must ... establish a national framework for achieving the object of this Act [i.e. protecting and enhancing air quality, preventing air pollution, securing ecologically sustainable development and securing an environment that is not harmful to health], which must include –*

- (a) *mechanisms, systems and procedures to attain compliance with ambient air quality standards;*
- (b) *mechanisms, systems and procedures to give effect to the Republic's obligations in terms of international agreements;*
- (c) *national norms and standards for the control of emissions from point and non-point sources;*
- (d) *national norms and standards for air quality monitoring;*
- (e) *national norms and standards for air quality management planning;*
- (f) *national norms and standards for air quality information management; and*
- (g) *any other matter which the Minister considers necessary for achieving the object of this Act.*

(2) *National norms and standards established in terms of subsection (1) must be aimed at ensuring –*

- (a) *opportunities for public participation in the protection and enhancement of air quality;*
- (b) *public access to air quality information;*
- (c) *the prevention of air pollution and degradation of air quality;*
- (d) *the reduction of discharges likely to impair air quality, including the reduction of air pollution at source;*
- (e) *the promotion of efficient and effective air quality management;*
- (f) *effective air quality monitoring;*
- (g) *regular reporting on air quality; and*
- (h) *compliance with the Republic's obligations in terms of international agreements.*

(3) *The national framework –*

- (a) *binds all organs of state in all spheres of government ...*

The central role of AAQS

The Guide's analysis positions AAQS at the centre of legal regimes for air quality governance, since AAQS represent globally accepted apex standards for clean air,


directed to ensure the overall quality of air for certain pollutants. AAQS have been, and continue to be, an effective catalyst for action in generating change in air quality policy globally. The Guide also recognizes that ambient air quality law is in a state of evolution,

particularly since these apex standards are likely to evolve over time towards higher levels of ambition for public health, as seen with the publication of the WHO AQGs.

With its focus on AAQS, the Guide is concerned with the regulation of ambient air, and references to ‘air quality law’ throughout the Guide should be read accordingly. **Ambient air** can be understood as air in outdoor environments that is well-mixed, which might reasonably be encountered by a member of the general public in day-to-day life. This is distinct from air that an individual may encounter through occupational activities or air that is very close to a point source of emissions. An **ambient air quality standard** is a value set for a minimum acceptable quality of outdoor air, referenced as a measured mass concentration (e.g. units of micrograms per cubic metre), mixing ratio or mole fraction (e.g. expressed for example as parts per billion, nanomoles per mole), of a specified pollutant or group of pollutants. AAQS are “immission” standards in contrast to emission standards, expressing the

air quality resulting from a collective accumulation of emissions from various sources (both point and mobile) within the ambient air.

AAQS most commonly describe a mean concentration that is to not be exceeded over a predefined time-averaging interval, such as 24 hours or one year. They can be standards to be achieved currently (sometimes referred to as “limit values”) or in the future (“target values”, “target standard”, “long-term targets”). They can also be constructed as “alert thresholds” and “information thresholds”, which do not set a standard of air quality to be achieved as such, but prescribe a standard at which alerts or information should be given in order to protect the public at large or certain vulnerable groups.

Examples of these different types of AAQS are defined in Directive 2008/50 of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe (the CAFE Directive). 



European Union
CAFE Directive 2008
Article 2

(5) ‘limit value’ shall mean a level fixed on the basis of scientific knowledge, with the aim of avoiding, preventing or reducing harmful effects on human health and/or the environment as a whole, to be attained within a given period and not to be exceeded once attained; ...

(9) ‘target value’ shall mean a level fixed with the aim of avoiding, preventing or reducing harmful effects on human health and/or the environment as a whole, to be attained where possible over a given period;

(10) ‘alert threshold’ shall mean a level beyond which there is a risk to human health from brief exposure for the population as a whole and at which immediate steps are to be taken by the Member States;

(11) ‘information threshold’ shall mean a level beyond which there is a risk to human health from brief exposure for particularly sensitive sections of the population and for which immediate and appropriate information is necessary;

The notion of a “standard” can also imply some legal “bindingness” or “enforceability” of that standard (see for example WHO 2021, ix). For the purpose of the Guide, the notion of an air quality standard does not presuppose any enforceability of that standard or any institutional requirements associated with it, such as requirements for monitoring. This is because the Guide breaks down all legal elements associated with AAQS to show how they are, or might be, constructed legally within a robust system of national air quality governance. These different elements cannot be assumed by the mere existence of an air quality standard.

Legislative design of robust air quality governance

Developing AAQS through legislation – beyond including them in policies alone – is important to provide a legal foundation for producing, scrutinizing, reviewing, publicizing and enforcing AAQS.

In the Guide, “legislation” refers to all laws and regulations made under legislative authority. Whatever the constitutional structure of a given country, legislation includes all laws and regulations established by any formal state-sponsored legislative process, and includes both:

- **Primary legislation**, enacted by a parliament or legislature, where political choices are formalized through law-making in line with constitutional conventions or requirements, including Acts, statutes, European Union directives of the Parliament and the Council, etc.; and
- **Secondary legislation**, developed under powers prescribed in primary legislation or otherwise lawfully issued by governments or emanations of executive authority (a Ministry, the European Commission, etc.), with or without some parliamentary oversight, including regulations, subordinate legislation, directions, orders etc. The system of air quality governance outlined in Figure 1 shows how the legislative incorporation of AAQS sits within, and provides the foundation for, a

wider legislative architecture. Numerous legislative features are relevant, from statutory rights to air quality information, to statutory requirements for air quality monitoring. While having all these elements may not guarantee air quality outcomes, they establish institutional foundations for a robust system of air quality governance. National air quality legislation will still sit within a broader institutional, policy, economic, resourcing and governance picture that determines its ultimate effectiveness.

Scope of the Guide

The Guide does not address the specific design of discrete regulatory regimes that support attaining AAQS, such as the regulation of vehicle or industrial emissions; however, it does consider how such regimes should be legally coordinated with AAQS regimes (**section 8**). The detailed technical design of suitable air quality monitoring systems is also beyond the scope of the Guide. However, key considerations, generic requirements and national competencies needed for delivery of the technical aspects of air quality regimes are described. More broadly, “air pollution law” might cover all forms of atmospheric pollution, including pollution from greenhouse gases leading to climate change, or stratospheric ozone-depleting substances; this too is beyond the immediate scope of the Guide, which focuses on the control of ambient air pollutants that directly impact public health via inhalation.

The Guide does not cover other legal instruments and doctrines that are also relevant in national legal cultures to protect air quality and support the legal implementation of AAQS. Thus, for example, some countries may have legal doctrines or civil procedure rules that facilitate or hinder legal claims in court in relation to air that causes nuisances, or otherwise falls below legal standards. This includes civil or tort law doctrines of nuisance or the notion of fault in breaching a duty of care owed by a public authority or an individual to avoid causing harm to others (which may or may not apply in relation to air quality problems, depending on the relevant national legal tradition).

National constitutional guarantees may also provide an important legal backdrop to the national legal recognition and implementation of air quality standards. These are addressed in some examples in the Guide, but are specific to particular countries and are not comprehensively mapped.

How should the Guide be applied within national legal contexts?

Specific national legal expertise will be needed to adapt and apply the Guide within national legal contexts. National lawmakers using the Guide will need to ensure they are liaising with appropriate teams in government, or relevant external experts, where key contextual issues lie outside their direct expertise. In particular, consideration should be given to:



The nature of the legal system. This will affect how air quality standards and related obligations may be incorporated into legal structures. A legal system will have diverse influences, including how legal obligations are interpreted and enforced by courts, as well as how such obligations are incorporated within legal frameworks in the first place. As an example, to date, civil law countries are more likely to have incorporated AAQS into legal instruments (UNEP 2021a, 49).



Constitutional rights. There is a correlation between countries with constitutional rights to a healthy environment and/or clean air, and the incorporation of AAQS in legal instruments (GAAPL, 49). Some air quality laws explicitly draw on constitutional guarantees to

enhance air quality provisions (e.g. South Africa's Air Quality Law 2004, section 3), whilst in other countries, constitutional rights provide foundations for interventionist judicial review of air quality regimes (**section 6**, 2019 case of the Brazilian Federal Supreme Court).



A country's **constitutional structure**. In addition to any constitutional guarantees, the structure of the state and levels of government can have a significant influence on air quality governance and institutional responsibility. In federal systems in particular, allocation of federal versus subfederal responsibilities for air quality standards and management will affect which level of government has legal control over air quality governance. This may lead to regulatory coordination issues if powers to legislate for AAQS and powers to manage air quality sources are divided across federal or central government and subnational governments.



Air quality emission sources and who/what is affected. This will generally require having a reliable and regularly updated national inventory on air emissions (resolved both spatially and by pollutant type), as well as data on population exposure and which ecosystems are affected by air pollution. This may influence which sectors, industries or pollutants are prioritized for legal control, and whether specific geographies, susceptible groups or particular types of ecosystems are identified as requiring specific protection. In particular, the collection of data disaggregated by sex and age of populations exposed to air pollution is recommended. Understanding the gender- and age-differentiated impacts of air quality is fundamental in developing effective and equitable policies and interventions.



The general structure of legislation on air quality or the environment. Not all countries have an all-encompassing clean air Act. Obligations relating to air quality may be spread across different pieces of legislation, and how these instruments interact legally will be important in considering the issues in the Guide.



The maturity of air quality legislation and any planned revisions. As Figure 1 highlights, regular review of air quality law is important in air quality governance, to reflect evolving knowledge of the nature and impacts of air pollutants, and as emission sources change due to economic, technological or social evolution.



Relevant **case law and the role of national or supranational courts** in supporting a system of air quality governance. This is particularly important in appraising how enforceable legal instruments (containing AAQS and related requirements) are within national legal systems.



Cost and capacity constraints. Internal or external factors may constrain or influence the pace at which countries increase their national ambition for air quality standards. This may include limitations on the capacity of their administrative and scientific structures to provide support for air quality regimes, budgetary pressures (at government or individual household level), and limited capacity or awareness across relevant government departments in implementing air quality policy.





STRUCTURE OF THE GUIDE AND HOW TO USE IT

The following sections of the Guide elaborate the issues outlined in the lawmaking ‘checklist’ set out in the executive summary. These issues work through the full range of issues relevant to lawmaking to embed AAQS within legal regimes. These relate to the global context for air quality laws (**section 2**), and the core elements of a robust system of national air quality governance (Figure 1).

Lawmakers in different countries may focus on different sections of the Guide as relevant to their

national legal priorities, but a view should always be kept on the holistic legal architecture that is being designed or amended, to ensure that it has legal integrity overall as an effective and enforceable legal regime.

In relation to each legislative issue identified, matters to consider are listed or described. Other resources to support an understanding of the issues covered include:

RESOURCES



Illustrative legislative examples from national air quality legislation in different countries, representing a cross section of jurisdictions globally. These are not endorsed as model legislation, and are included in text boxes with the legislation icon. These examples are either official or unofficial translations, as indicated. For unofficial translations, these were provided by national governments, or taken from online language translation tools (mainly Google translate), and so reference to the original language text is advised.



Case law and other illustrative examples. These show how air quality laws have been interpreted in different jurisdictions, as well as other practices supporting air quality regimes. These are included in text boxes with the gavel icon.



References and further reading in section 9.

Further support on capacity-building for air quality governance

At its first and third sessions, the United Nations Environment Assembly called on Member States to take concrete actions across sectors to reduce all forms of air pollution (UNEP 2016a; UNEP 2016b; UNEP 2017). UNEP demonstrated its commitment to support governments in responding to these calls through the development of a global air quality programme, as well as an air pollution roadmap delivered under Montevideo Programme V. Combined, these programmes leverage the multidisciplinary areas of expertise of the organization in alignment with UNEP's overarching strategy to strengthen multisectoral engagement to improve environmental quality and the health and well-being of all (UNEP 2022a).

UNEP's programme on air quality provides support to low- and middle-income countries in several contexts, through providing advice on available air quality monitoring and affordable technologies; technical assistance and guidance tools aimed at strengthening air quality frameworks, including in high-emitting sectors; support in strengthening regional cooperation and opportunities for knowledge-sharing; and the development of a robust awareness-raising strategy and communication activities on air quality-related topics.

UNEP has developed a range of capacity-building initiatives centred around these key areas. UNEP supports countries in developing air quality action plans and strategies in sectors such as transport, agriculture or municipal waste burning, among others, to combat air pollution in high-emitting sectors. UNEP also develops training activities, tools and materials to encourage action and promote best practice on

source apportionment, air pollutant assessments and monitoring and pollution surveillance. It also undertakes regional, country and city-level assessments of air pollution to identify sources, impacts and solutions to air quality issues, which provide the foundation for targeted policy action. The development and promotion of observational networks/air quality monitoring networks, including through the promotion of low-cost sensor networks in partnership with citizen science initiatives, is also a major focus of UNEP's capacity-building activities aimed at improving air quality monitoring.

Under Montevideo Programme V, UNEP's capacity support aims to improve and strengthen national legislation on air quality, both through direct technical assistance to countries as well as through the development and dissemination of guidance materials such as this Guide, to build the knowledge and understanding of lawmakers and policymakers, and empower them to develop and strengthen air quality-related laws and institutions. Technical assistance requests can be sent through the UNEP Law and Environment Assistance Platform (UNEP LEAP)'s Clearing House Mechanism, available from <https://leap.unep.org/technical-assistance>.

In developing these capacity-building initiatives, UNEP gives special consideration to ensuring that gender considerations are fully integrated in both practical and substantive components of such activities. Capacity-building efforts developed with a gender-sensitive approach strive to ensure that women are effectively included in the conception, implementation and intended impacts of activities, in alignment with UNEP's commitment to support Member States in ensuring women's full and effective participation and equal opportunities for leadership in environmental decision-making (UNEP 2022a).



Global context for national air quality standards and legal frameworks

2



Global context for national air quality standards and legal frameworks

Are there international legal obligations for the adoption of AAQS, or otherwise relating to air quality governance, that apply to your country?

There is no global treaty setting out general obligations relating to air quality standards or governance (see UNEP 2021a, 24–26), although some long-standing regional treaties (for instance the Convention on Long-Range Transboundary Air Pollution [CLRTAP], covering European and proximate countries) limit emissions of pollution that may harm downwind states and set up cooperative arrangements on monitoring and data-sharing. In Africa, three political (“soft law”) agreements call for regional cooperation on the harmonization of AAQS, monitoring procedures and data management (Southern African Development Community Regional Policy Framework on Air Pollution, or Lusaka Agreement; Eastern Africa Regional Framework Agreement on Air Pollution, or Nairobi Agreement; Central and Western African Regional Framework Agreement on Air Pollution, or Abidjan Agreement). In Latin America and the Caribbean, there is also a Regional Action Plan on Air Quality (2022). In Asia, there is an Instrument for Strengthening the Acid Deposition Monitoring Network in East Asia, which was recently expanded in scope to explicitly cover air pollution.

Furthermore, in public international law, there is a customary “no harm” rule, which imposes the duty on all states to prevent, reduce and control the risk of environmental harm to other states and of areas beyond the limits of national jurisdiction, including through air pollution (*Trail Smelter Arbitration [United States of America v Canada] 1941*). This doctrine of public

international law is one legal route to pursue in disputes involving a transborder air pollution impact.

Within the European Union, a comprehensive harmonized legal regime on air quality has been in force for various pollutants since 1996, which applies within European Union Member States. The CAFE Directive imposes enforceable obligations on all 27 Member States, including a detailed legal framework for AAQS, air quality monitoring, public participation and access to justice.

Note there are other international obligations relating to air quality governance considered in **section 7**, relating to procedural environmental rights, which do not relate directly to setting air quality standards.

What is the relevance of 2021 WHO Global Air Quality Guideline Values for national air quality laws?

The WHO AQG values are foundational to air quality law and policy for two main reasons:

1. they provide an authoritative global reference synthesizing evidence underpinning a need for AAQS, especially in the absence of a global treaty on AAQS; and
2. they evaluate evidence of the effects of air pollution from the perspective of public health impacts and the potential avoidance of harms

As the WHO AQGs make clear, the specified guideline values “are not legally binding standards; however, they do provide countries with an evidence-informed tool,

which they can use to inform legislation and policy” (WHO 2021, 3). The WHO AQGs also include interim values which are intended for use in countries where air pollution is currently high, as steps towards achieving standards that reflect best possible air quality for that location.

This Guide shows that, while WHO AQG values can be directly included within legislative instruments, thereby being given some legal force within national legal systems, a holistic approach to embedding AAQS legally is required to ensure they are implemented most effectively. Furthermore, implementing WHO AQG values through legislation may require the planning of a sustainable transition to cleaner air, including through the use of interim legal standards, phased legislative review, and addressing issues of capacity and resources.

While the WHO AQGs set out guideline limits for a limited number of “classical” pollutants (PM₁₀, PM_{2.5}, O₃, NO₂, SO₂ and CO), many more pollutants affect air quality and public health. Indeed, the WHO AQGs set out “good practice statements” for certain PM types not specifically addressed by the AQGs: black carbon, ultrafine particles and sand/dust storms. National legal systems may thus regulate a wider or different range of pollutants, depending on expert assessment of the air pollution issues that affect that specific country. This issue of regulatory scope is considered further in **section 3** below.

How has the COVID-19 pandemic changed our understanding of air quality law?

The COVID-19 pandemic has created an impetus to reframe understandings of clean air with a strengthened focus on the health-related objectives for pollution, and to prioritize regulatory and political action in relation to air more generally. Restrictions on travel and industrial shutdowns during periods of public health restrictions, especially during the early phases of the pandemic, showed large real and perceived improvements in air quality, particularly in some of the world’s most polluted locations (World Meteorological Organization [WMO] 2021).

Outdoor air was promoted in many countries as a solution to help keep people safe from the possible accumulation of respiratory virus particles inside buildings. The spread of SARS-CoV-2 via airborne pathways indoors has led to the increased use of low-cost carbon dioxide sensors as an indirect measure by which building ventilation rates, and by extension the broader quality of indoor air, can be assessed. Alongside monitoring, active air filtration has been used widely in efforts to reduce concentrations of particles indoors.

In light of these developments, clean air is no longer seen simply as an issue of chemical pollutants and their scientific measurement in outdoor (or less often indoor) environments. It is also a question of air being safe for human health – clean air is safe air (Scotford 2020, 349). At a more fundamental level, the underlying health of populations has been one predictor for the severity of outcome from COVID-19 at a national scale. Air pollution, alongside obesity, physical inactivity and poor diet, have been proposed as increasing risk of morbidity and mortality.



Foundations of national air quality laws:

legislative elements,
scientific knowledge,
process, and scope

3



Foundations of national air quality laws: legislative elements, scientific knowledge, process, and scope

Why should AAQS be set in legislative instruments?


In the robust system of air quality governance proposed in this Guide, AAQS should be prescribed in a legislative instrument, or across a range of connected legislative instruments, for at least the following reasons (UNEP 2021a, 13):

- legislative processes are well adapted to cross-sectoral and evolving air pollution problems, since they allow political deliberation and ongoing review;
- legislative expression of standards provides legal certainty and potentially generates legal duties and rights;
- the enforceability of legislation is important in implementing AAQS, and a key aspect of an air quality governance system (section 6);
- legislation is significant symbolically, both in projecting an authoritative State-sponsored vision on air quality issues, and in facilitating social and economic change to address air pollution problems; and
- AAQS should be promulgated in public instruments, free and available to all (in contrast to private standards).

At the same time, legislative expression of AAQS does not guarantee that they are applied and respected. They must also be operationalized within a wider legislative structure setting out objectives, levels of ambition, processes of enforcement and accountability, monitoring, etc. A bare power to introduce AAQS will not provide meaningful legal context to inform the setting of AAQS, but it is a core foundation of a wider air quality regime.

Public versus private processes for setting AAQS

Private standardization processes, which are not legally constrained or constructed, do not provide foundations for systems of air quality governance in the same way. They are not made available without cost, they are not negotiated in the public arena, and they often remain voluntary and indicative as standards.

Some countries have hybrid regimes, where standards are produced by standardization bodies but are mandated by Government authorities and involve a broader constituency of stakeholders, with resulting texts being made publicly and freely available. 



Mexico

Normas Oficiales Mexicanas NOM-022-SSA1-2019

In Mexico, the preamble of the Normas Oficiales, in compliance with the federal law on Metrology and Standardization, provides that stakeholders were given the opportunity to participate in the development of standards. The Draft of the standard was been published in the Official Journal, so that, within sixty calendar days after such publication, interested parties could submit their comments to the National Consultative Committee on Standardization for Regulation and Health Promotion. The responses to the comments received by the Consultative Committee had been published in the Official Gazette, before the adoption and publication of the standard.

Another important aspect of legislating AAQS is to make them public, guaranteeing free access to the standards for the public at large. This is a basic requirement of the rule of law and an important aspect of rights to access environmental information, as discussed in **section 7**.

Key elements for adopting AAQS in legislation effectively

To ensure AAQS are effectively adopted, relevant primary legislation should establish at least three key basic elements:

- expected ambition;
- relation to the latest scientific and technological knowledge; and
- procedural requirements.

In terms of **ambition**, this is usually guided by explicit legislative objectives (discussed below), which may specifically inform the standard-setting process, as well as being guided by the broader policy context, as in the European Union with its ambition to move towards “zero pollution” and climate neutrality (see European Commission 2018). Factors to take into account in setting ambitious air quality standards are addressed in **section 4**.

Relating the standard-setting process to **adequate scientific information** may be done explicitly or implicitly. The Israeli Clean Air Law 5768-2008 demonstrates examples of both.



Israel

Clean Air Law 5768-2008 (unofficial translation)

Article 6. Air quality values

(a) The Minister shall set maximum values, as specified below, for presence in the air of pollutants enumerated in Schedule One at given intervals (hereafter, air quality values):

(1) values whose exceedance constitutes potential danger or harm to the life, health and quality of life of human beings, to property and to the environment, including in soil, water, fauna and flora, and which should be striven to achieve as a target (in this law, target values); the target values shall serve as a basis for setting the targets of the programme, as per its meaning in section 5;

(2) values whose exceedance constitutes considerable or unreasonable air pollution, to be set on the basis of the target values and of updated scientific and technological knowledge, and in consideration of the practical possibility of preventing exceedance from the target values (in this law, ambient air quality values);

(3) values whose exceedance, in short-term exposure, causes or is liable to cause danger or harm to the health of human beings, and which require undertaking immediate measures to prevent their exceedance or to prevent the damage derived from their exceedance (in this law, alert threshold).

As for **procedural requirements**, a number may be relevant in designing relevant legislation: the form of legislative process to be used (considered in the next question), relevant stakeholders to consult (considered further below), and timing.

On timing, if AAQS are not directly prescribed in primary legislation, a deadline for introducing AAQS is sensible, particularly in light of global experience with legislative powers not being exercised in some countries (31 per cent of countries had not exercised such powers in 2020: UNEP 2021a, 50). A timing requirement also implies that there is a duty to introduce standards, rather than remaining with a bare power. One example is the Environment Act 2021 of the United Kingdom of Great Britain and Northern Ireland, which required two new air quality standards to be introduced within approximately 10 months. This was done by specifying within primary legislation a deadline before which draft regulations setting the standards were required to be laid before Parliament (United Kingdom of Great Britain and Northern Ireland, Environment Act 2021, section 4(9)). In practice, this was a demanding time frame considering the expert evidence that needed to be gathered, and the time required for meaningful public consultation, but it had the advantage of maintaining momentum to introduce the new standards.

What should be the purpose(s) of an air quality legal framework?

The purpose or objective driving air quality law is an important foundation of an air quality governance system, informing its level of ambition and the focus of regulatory attention. Increasingly, air quality is explicitly framed in legislation (and in some constitutions) as a matter of public health and/or environmental protection, and not as a solely technical issue concerning industrial pollution control or to be settled in scientific circles alone. While some countries have noted public health as a purpose behind air quality regimes for some time, the importance of a high level of ambition driving air quality regimes has been heightened in light of the WHO AQGs, increasing public awareness of air pollution-related health problems globally, and public interest litigation and other campaigning by civil society organizations pressing governments around the world to address harm to public health caused by air pollution.

As **section 2** showed, a contemporary legislative regime for air quality should pursue the purpose of achieving clean air for public health. The WHO AQGs confirm that the public health impacts of air pollution, even at relatively low concentrations, have become more certain due to advances in scientific knowledge, with complementary evidence from fields such as epidemiology, toxicology and cell biology. A legislative objective that expresses public health as a primary objective of air quality law (either alone or alongside environmental protection) thus aligns that legal framework with the goals of the WHO AQGs.



The Supreme Court of the United States of America has interpreted the delegated rulemaking power of the Environmental Protection Agency to set AAQS under section 109(a) of the United States of America Clean Air Act as being informed by a public health purpose alone, with no consideration of economic considerations permitted: *“The agency should be allowed to have some discretion in setting the guidelines. However, the agency decision-maker does not have the discretion to consider the financial impact of its environmental regulations. The Clean Air Act contains no support for the view that Congress intended cost to be a relevant factor in the agency’s determinations”*

(Whitman v American Trucking Associations, Inc. 2001).

The good functioning of ecosystems is another important purpose of air quality regimes. Emissions into the air affect all aspects of the environment, from soil to water and biodiversity. Most notably, deposition of air pollution adds excess sulfur and nitrogen to the environment, leading to acidification, eutrophication and biodiversity reduction, while ozone deposition damages the leaves of plants and trees, and lowers crop yields (United Nations Economic Commission for Europe). Impacts on ecosystems are often protected through limits set for “critical loads”, or maximum amounts of a pollutant that may be deposited into an environment

without causing significant harmful effects. It should be noted that, while the basic air pollutants relevant to ecosystem protection are broadly the same as for health, the units of measurement and legal expression of limits or targets are different to those used for AAQS. For example, the deposition of PM_{2.5} to the land surface is harmful to ecosystems; however, that harm is expressed as an amount of excess nitrogen or sulfur deposited, rather than the amount of PM_{2.5} itself (which would be the AAQS metric). AAQS are generally likely to deliver against other ecosystem objectives, but would be unlikely to define them, and other complementary regulatory techniques may be required to pursue further purposes.

Achieving clean air is also necessary to support a broad health economy and to protect infrastructure, cultural heritage, natural capital and leisure amenities from damage and degradation. An air quality regime may also be complementary to, or support the attainment of, other environmental laws or obligations, for example those related to climate change. **Section 8** considers how aligning different environmental (and other) policies can be critical for the effective implementation of air quality regimes.

Which level of government should adopt AAQS?

Globally, the adoption of AAQS is most often centralized within countries (UNEP 2021a, 46), which is consistent with providing equitable standards for all. However, for some geographically large countries, with federal or other multilevel forms of government, differentiation of standards at provincial or regional levels is observed, particularly if different areas are moving towards ambitious air quality standards at different paces. Differentiation in standards is more readily justified where substantial geographic gradients in air pollution occur due to natural factors such as meteorology or topography. As an example, section 10 of South Africa's Air Quality Act of 2004 allows that, in addition to national AAQS which must be set for pollutants that present a threat to health, well-being or the environment in the country as a whole, provincial governments may also set AAQS in the following way, allowing for differential standard setting (see bold text in the following extract).



South Africa

National Environmental Management: Air Quality Act 2004

Section 10: Provincial standards

(1) The [Member of the Executive Council responsible for air quality management] may, by notice in the Gazette –

(a) identify substances or mixtures of substances in ambient air which, through ambient concentrations, bioaccumulation, deposition or in any other way, present a threat to health, well-being or the environment in the province or which the MEC reasonably believes present such a threat; and

(b) in respect of each of those substances or mixtures of substances, establish provincial standards for –

(i) ambient air quality, including the permissible amount or concentration of each such substance or mixture of substances in ambient air; or

(ii) emissions from point, non-point or mobile sources in the province or in any geographical area within the province.

(2) If national standards have been established ... for any particular substance or mixture of substances, the MEC may not alter any such national standards **except by establishing stricter standards for the province or for any geographical area within the province.**

(3) A notice issued under this section may –

(a) differentiate between different geographical areas within the province;

(b) **provide for the phasing in of its provisions;** and

(c) be amended.

To leave adoption of a country's main AAQS to local governments alone is not generally a feasible approach. Local approaches typically focus on enhanced management of emissions (e.g. through the adoption of "low emissions zones") relating to pollutants such as NO₂ that have residence times in air of only a few hours. Concentrations of such pollutants can reasonably be considered controllable at the local level, and therefore managing emissions at source is preferable to having different localized targets for concentrations in ambient air. In exceptional cases, a differentiation towards more stringent AAQS may be considered necessary, for example, to protect specific vulnerable populations and social groups or localized areas with urgency.

What kind of legislative process is used to introduce AAQS?

Air quality legislation is often a multilayered body of laws, which should operate as a coherent system, including some combination of:

- **generic environmental primary legislation, such as environmental codes, environmental protection Acts and environmental standards Acts;**

- **sector-specific primary legislation, such as clean air Acts (as in Cyprus, the Philippines and the United States of America) or air quality standards Acts;**
- **secondary legislation containing details on AAQS and/or air quality monitoring, planning, etc., adopted under primary legislation; or**
- **AAQS that are not themselves contained in legislation (for instance contained in technical standards or policy guidance) but which are created under a legislative framework. An example is China's air quality standards, issued as standard GB 3095-2012 (2012), under the authority of Law of the People's Republic of China on the Prevention of Atmospheric Pollution 2000. AAQS have some legal effect since they are created by a mandate prescribed in legislation.**

Federal or decentralized governmental structures may also impact the choice of the appropriate legislative process for adopting AAQS.

Using secondary or delegated legislation to promulgate AAQS has some advantages. It allows setting out detailed technical information that is not normally found in primary legislation, and allows more flexibility in the updating of requirements over time, so that AAQS can be

kept up-to-date with latest scientific thinking. However, there are also risks associated with the use of secondary legislation. It may be subject to less robust scrutiny in its creation; it is more at risk of repeal or regression through legislative revision than primary legislation. Furthermore, AAQS set in secondary legislation do not always link to legal obligations on the state to achieve these standards, monitoring requirements, or sanctions for non-compliance with AAQS.

Whichever legislative process is adopted to introduce AAQS, it will need to balance these different considerations and ensure that, within the relevant political and legal culture, the integrity of the whole system of air quality governance is carefully constructed and maintained (taking into account all aspects of a robust system of air quality governance outlined in this Guide).

How are stakeholders and the public included in the process of setting AAQS?

Some recent air quality law frameworks globally prescribe a public participation process in the adoption of AAQS, open to stakeholders and/or the public at large (UNEP 2021a, 70). To allow for meaningful participation, any relevant interested party should be informed of the

opportunity to participate in any process to develop new AAQS and be entitled to submit their opinion. This is particularly relevant for those who are disproportionately impacted by air pollution, including representatives of the poorest women and men who produce the least emissions and who are highly susceptible to the impacts of air pollution. Opportunities to participate should be based on a proposal concerning new or revised AAQS that is publicly available and widely circulated, which should allow sufficient time for detailed consideration of the proposed AAQS. Having such a process accords with globally influential norms of environmental democracy (**section 7**) and is important for addressing public expectations around safeguarding public health. Article 8 of the UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (the Aarhus Convention) prescribes steps to promote effective public participation in relation to new legislative proposals “at an appropriate stage, and while options are still open”.

Legislation may frame public participation as an open requirement (anyone from the “public” can participate), and/or require that consultation with representative councils, organizations or vulnerable groups is specifically required. Some countries also have general constitutional rights of public participation in formulating new proposals for laws or programmes (UNEP 2021a, 69), which would in principle extend to devising AAQS in legislation.



Aarhus Convention 1998

Article 8

Each Party shall strive to promote effective public participation at an appropriate stage, and while options are still open, during the preparation by public authorities of executive regulations and other generally applicable legally binding rules that may have a significant effect on the environment. To this end, the following steps should be taken:

- (a) Time-frames sufficient for effective participation should be fixed;*
- (b) Draft rules should be published or otherwise made publicly available; and*
- (c) The public should be given the opportunity to comment, directly or through representative consultative bodies.*

The result of the public participation shall be taken into account as far as possible.



Australia

National Environmental Protection (Ambient Air Quality) Measure 2016

5. Desired environmental outcome

The desired environmental outcome of this Measure is ambient air quality that minimises the risk of adverse health impacts from exposure to air pollution.

More specifically, air quality regimes may establish a participation process for the adoption of AAQS. Articles 16–18 of Argentina’s Law on the Regulation and Preservation of the Air Resource and the Prevention and Control of Atmospheric Contamination (2004) thus allows any interested party to submit its opinion to the Enforcement Authority, based on the proposal of the Permanent Advisory Council, within a period of 10 business days after the proposal for air quality standards is publicized. The Enforcement Authority must formally explain any rejection of the proposals made by the interested parties. This time frame is extremely short, and risks limiting substantive contributions from the public. This can be contrasted with the United Kingdom of Great Britain and Northern Ireland Environment Act 2021, discussed above, which included a longer period for public (and expert) consultation in devising new air quality standards under sections 1 and 2 of the Act, and which involved engaging with the underlying evidence justifying the new standards. A period of two to three months is more realistic for meaningful public consultation.

Designing the legislative purpose of an ambient air quality regime

Objectives of air quality law have legal consequences, such as guiding the interpretation of legal obligations (UNEP 2021a, 38). To that end, it matters where objectives are located within legislative frameworks and the kind and level of ambition they express.

Location of legislative objectives

The location of legislative objectives will depend in large part on any existing legislative architecture of a country’s air quality law. In reviewing existing, or designing new, air quality legislation, the following considerations should be taken into account in relation to legislative objectives:

- **Explicit objectives contained *within* a dedicated air quality law have the advantage of being focused and closely connected to its provisions. An example is seen in the case of Australia’s National Environmental Protection (Ambient Air Quality) Measure, which has a clear public health objective specific to ambient air quality.**

- **Explicit objectives should be securely embedded in legislative frameworks, so that a body of air quality law is interpreted and applied holistically and consistently to achieve desired health and environmental outcomes. This usually means that objectives should be contained in primary legislation.**



As an example of how legislative objectives inform air quality law for public health outcomes, the Court of Justice of the European Union (CJEU) held the following in Case C-644/18 *Commission v Italy* (2020):

84. [I]t must be emphasised, as is apparent from recitals 17 and 18 of Directive 2008/50, that the EU legislature set the limit values laid down by that directive in order to protect human health and the environment, while taking full account of the fact that air pollutants are produced by multiple sources and activities and that various policies, both at national and EU level, may have an impact in that regard, [with the consequence that a country cannot exempt itself from compliance with the clear obligations to meet the AAQS outlined in this EU legislation].

- Where air quality standards are promulgated in secondary legislation under a more general primary law relating to air quality or environmental protection more generally, explicit objectives in that primary law should be reviewed and, if necessary, updated or clarified, in order to include public health goals (in addition to any environmental protection goals).
- Some air quality laws are, or will be, developed within a constitutional framework that promotes clean air or a healthy environment as a constitutional right, thereby informing the objectives of legislation through a superior national law. Whether this supports the legal ambition of national air quality legislation will depend on the country's legal and political tradition. Review of the legislative framework, in light of this constitutional context, will also be required to embed a comprehensive and ambitious scheme for air quality governance.

Substance of legislative objectives and level of ambition

The level of ambition expressed in the objective of air quality legislation will inform its provisions, and may be influential in informing the interpretation and legality of discrete obligations and processes within the relevant air quality legal framework (in assessing their proportionality for instance). The following considerations should be taken into account in designing or reviewing the substance of air quality objectives in legislation:

- A legislative framework should ideally express a clear intent of ambition to regulate and manage air quality for public health. Air quality laws may have multiple objectives. These goals should be complementary and reinforcing, linking various aspects of a robust system of air quality governance, and ensuring that any specified goals do not undermine core public health and environmental objectives.



European Union CAFE Directive 2008 Article 1

This Directive lays down measures aimed at the following:

1. *defining and establishing objectives for ambient air quality designed to avoid, prevent or reduce harmful effects on human health and the environment as a whole;*
2. *assessing the ambient air quality in Member States on the basis of common methods and criteria;*
3. *obtaining information on ambient air quality in order to help combat air pollution and nuisance and to monitor long-term trends and improvements resulting from national and Community measures;*
4. *ensuring that such information on ambient air quality is made available to the public;*
5. *maintaining air quality where it is good and improving it in other cases;*
6. *promoting increased cooperation between the Member States in reducing air pollution.*

- Ambitious objectives provide a legislative foundation for progressing towards more ambitious AAQS over time, including through the use of interim standards. Section 4 explains how legal AAQS should be reviewed periodically as an element of robust air quality governance. A particularly ambitious set of legislative objectives is seen in the Philippine Clean Air Act of 1999, which declares “principles” and “policies” that, inter alia, recognize citizens’ rights to clean air, and the importance of preventing rather than controlling pollution, as policy priorities.

Designing the scope of national air quality laws

Many issues of scope should be deliberately addressed when elaborating a robust regime of AAQS governance. These issues are political choices about how wide-ranging and comprehensive an air quality regime will be.

Definitional scope: defining air pollution and air quality

Some national legal frameworks do not contain a clear definition of air pollution, air pollutants, or air quality, raising legal questions about the scope of these regimes

which can lead to inadequate coverage of regimes and questions for judicial interpretation about how far air quality regimes extend (UNEP 2021a, 39).

- A robust legislative framework should define the scope of the air pollution that it covers as clearly as possible, and in a way that facilitates interpretation of the legal regime by courts and legal practitioners within that legal culture in a manner that promotes public health.
- Definitions should, wherever possible, promote aspects of air ‘quality’ and not focus only on controlling emissions of ‘pollution’, consistent with the objective of promoting good public health.
- Based on a review of definitions globally, non-exhaustive and expansive definitions that define air pollution in terms of harm to health are most consistent with a robust system of air quality governance that prioritizes public health outcomes.

The following examples are non-exhaustive legislative definitions that promote public health, people’s well-being, the environment, and the utility of air resources for “legitimate uses”.



Argentina

Autonomous City of Buenos Aires Law No. 1356 on the Preservation of Air Resources and the Prevention and Control of Atmospheric Pollution 2004

Article 3

Atmospheric pollution means the direct or indirect introduction through human activity of substances or energies into the atmosphere, which may have detrimental effects on human health or the quality of the environment, or which may cause damage to material goods or deteriorate or harm the enjoyment or other legitimate uses of the environment.



Bolivia

Regulation on Air Pollution 1995

Article 6

Air quality means the concentrations of pollutants that make it possible to characterize the air of a region with respect to reference concentrations, set for the purpose of preserving the health and well-being of people.

- To ensure the air quality regimes cover all air pollution damaging to health, the legal definition of air pollution should also avoid defining air pollution by reference to breaches of specific air quality standards or air quality standards more generally, particularly where those standards might not (yet) be sufficiently ambitious in relation to desired public health outcomes (section 4).

Regulating “ambient air” and extending regulatory scope to indoor air pollution

Where the scope of an air quality regime is defined, many current regimes apply only to ‘ambient air’, defined as meaning the air that is well-mixed in outdoor environments only. The United States Clean Air Act sets out a conventional definition of “ambient air”.

In a similar vein, AAQS have conventionally been designed to apply only to outdoor air, and, although outdoor exposure represents only a fraction of an

individual’s total exposure, this has proved to be a generally reliable metric for expressing the overall combined harms of indoor and outdoor exposure (WHO Regional Office for Europe 2013).

However, increasing awareness of the importance of air quality in indoor environments impacting on public health is leading policymakers to consider how indoor air can be included within the scope of air quality regimes. This is particularly because women and young children who spend the most time near the household hearth in some countries are disproportionately affected by indoor air pollution.¹ In light of the challenges of imposing controls in indoor environments (since indoor exposure is overwhelmingly a function of indoor occupant behaviours), advice or guidelines on indoor air may be preferable to legal standards. However, countries may decide to design regimes to cover indoor air, and some legal definitions are more malleable across the indoor/outdoor boundary, as seen in the Sierra Leone Environmental Protection Agency Act 2008.



United States of America

Clean Air Act 1963

§50.1

(e) Ambient air means that portion of the atmosphere, external to buildings, to which the general public has access.

¹ For more information on how air pollution affects human health, in particular children’s health, see UNEP (2022c), developed for the third International Day on Clean Air for Blue Skies.



Sierra Leone

Environmental Protection Agency Act 2008

Section 40

Ambient air means the atmosphere within and outside a structure or within any underground space.

Some countries do regulate indoor air within their air quality regimes, such as Saudi Arabia or Bolivia, with specific provisions relating to maintaining acceptable levels of indoor air quality.

Furthermore, the WHO AQGs now define “ambient air pollution” to include outdoor pollution that affects indoor environments:

Ambient air pollution. *Air pollution in the outdoor environment, that is, in outdoor air, but which can enter or be present in indoor environments.*

This updated WHO definition emancipates air quality from the dominant indoor/outdoor distinction, which does not take into account the circulation of diffuse air pollution between outdoor and indoor environments (in homes, classrooms, offices, underground railways, etc.). It also creates new governance possibilities, taking into account indoor impacts when regulating ambient air quality. For example, monitoring in indoor environments may provide evidence of polluted outdoor air breaching AAQS in proximate outdoor environments, indicating areas for active management by public authorities.

Which pollutants should AAQS regulate within air quality regimes?

It is widely observed in most countries that some combination of $PM_{2.5}$, PM_{10} , NO_2 , SO_2 and O_3 are the air pollutants that currently cause most harm to health. These are the “classical” pollutants covered by the WHO AQGs, but these are not a definitive or exhaustive list for legal control in every country. For example, there exist a number of air pollutants classified as persistent organic pollutants, including pesticides, polychlorinated and brominated compounds and dioxins. Persistent

organic pollutants are included in international air pollution agreements that are meant to limit their emissions (for example the global Stockholm Convention on Persistent Organic Pollutants 2001, in force 2004, revised 2019), with flexibilities for countries with economies in transition. Their major impact is via bioaccumulation in the environment, and regulatory efforts to limit human exposure and harm are generally directed at point sources (waste incineration and co-incineration facilities for instance) or at end reservoirs, such as drinking water or food, rather than in ambient air itself.

To ascertain the appropriate air pollutants to come within the scope of national air quality law, each country needs to assess its “chemical climate” and produce AAQS for those pollutants of greatest local significance. For example, emissions that are unique to major industries may require specific AAQS for trace pollutants such as metals. As concrete examples, in 2022 Japan set AAQS for NO_2 , SO_2 , CO, suspended PM, $PM_{2.5}$, photochemical oxidants, benzene, trichloroethylene, tetrachloroethylene, dichloromethane, and dioxins; while the European Union sets AAQS for $PM_{2.5}$, PM_{10} , SO_2 , NO_2 , CO, benzene, O_3 , lead, arsenic, cadmium, nickel and polycyclic aromatic hydrocarbons. For pollutants falling outside of the WHO guidelines, it is likely that expert scientific review of national pollution sources will be required to support the development of country- or industry-specific AAQS.

Countries should also have a legal mechanism to identify and consider ‘novel’, or emerging, pollutants within their regulatory architectures and to set standards for these if required, as part of a process of regularly reviewing AAQS (see Figure 1). This review process should also ascertain whether some pollutants covered are out-of-date or could be better described by different internationally recognized scientific categories.

Geographical scope of air quality law

The ultimate objective of ambient air quality law – protecting human health – implies that good air quality is a benefit that should be available to all people, wherever they live or travel. This has implications for the scope of air quality law. If AAQS apply equally in all areas within a country's jurisdiction, this maximizes equity and environmental justice, and respects the nature of air pollution as a problem that manifests locally as well as remotely.

By contrast, some countries limit the geographical extent of AAQS, using different legal zones for standard-setting purposes. For example, AAQS may be more stringent in residential and natural park areas than in industrial areas. Such approach is a cause of environmental injustice to the extent that people are not equally protected against air pollution, particularly for people living or working in areas within or adjacent to zones allowing higher pollution levels. In extreme cases, industrial areas where higher levels of pollution are legally permitted may lead to “sacrifice zones”, defined as “a place where residents suffer devastating physical and mental health consequences and human rights violations as a result of living in pollution hotspots and heavily contaminated areas” (UNGA 2022b, 27). At the same time, allowing higher levels of pollution in some areas over others, within a single country, may be justified on the basis of geographical or environmental conditions (for example, affecting dispersal of pollution) or population exposure patterns, as noted above. Any such flexibility should not be used to disguise public health injustices;

zoning that allows the setting of differential levels of AAQS should be justified according to scientific evidence and rigorous analysis of public health outcomes.

Beyond setting AAQS, other aspects of air quality law may designate geographical areas for specific legal obligations or consequences, particularly in relation to monitoring and management, as discussed in **section 5** below.

Transboundary scope of air quality law

Where the scope of air pollution law is restricted to domestic sources of pollution only, and does not account for the influence or control of transboundary pollution, this can give rise to problems in attaining domestic AAQS and, more generally, for addressing public health problems associated with air pollution. Research shows that the management of transboundary air pollution is not always incorporated into national air quality regimes: 63 per cent of countries in 2020 did not have legislative provisions dealing with transboundary air pollution (UNEP 2021a, 41).

Where countries are part of a supranational region that regulates air quality, this facilitates national regulation of transboundary air pollution moving across different countries. As an example, the CAFE Directive addresses transboundary air pollution effects as between European Union Member States.

This obligation is supported by further obligations of each individual Member State, relating to AAQS governance under the CAFE Directive and imposing other legal controls,



European Union
CAFE Directive 2008
Article 25

*(1) Where any alert threshold, limit value or target value plus any relevant margin of tolerance or long-term objective is exceeded due to significant transboundary transport of air pollutants or their precursors, the Member States concerned shall cooperate and, where appropriate, draw up joint activities, such as the preparation of joint or coordinated air quality plans pursuant to **Article 23** in order to remove such exceedances through the application of appropriate but proportionate measures.*

notably national emission reduction commitments under European Union Directive 2016/2284 of the European Parliament and of the Council on the reduction of national emissions of certain atmospheric pollutants.

For countries that are not within such a supranational legal region, different considerations arise and designing appropriate legal mechanisms is more complex. The South African Air Quality Act 2004 provides one example, highlighting how countries can assert direct regulatory control over transboundary air pollution originating within

their borders, but will not be similarly supported unless neighbouring countries have similar powers and controls.

The Republic of Korea's Enforcement Decree of the Clean Air Conservation Act provides another approach where domestic authorities are required to consider how to prevent domestic impacts of long-range transboundary air pollution originating outside national borders. While the pollution source is beyond the control of its legal jurisdiction, it is nonetheless recognized as a governance issue to be tackled due to its domestic impacts.



South Africa

National Environmental Management: Air Quality Act 2004

Article 50. Transboundary air pollution

(1) The Minister may investigate any situation which creates, or may reasonably be anticipated to contribute to-

(a) air pollution across the Republic's boundaries; or

(b) air pollution that violates, or is likely to violate, an international agreement binding on the Republic in relation to the prevention, control or correction of pollution.

(2) If the investigation contemplated in subsection (1) reveals that the release of a substance into the air from a source in the Republic may have a significant detrimental impact on air quality, the environment or health in a country other than the Republic, the Minister may prescribe measures to prevent, control or correct the releases within the Republic.



Republic of Korea

Clean Air Conservation Act 2007

Article 13

(20) The Minister of Environment shall consult with the heads of relevant central administrative agencies and hear opinions of the Mayors/Governors every five years for the prevention of damage caused by long-range transboundary air pollutants in order to formulate comprehensive measures for the prevention of damage caused by long-range transboundary air pollutants ...

Taking into account vulnerability of certain groups in air quality regimes, including gender

Specific legislative measures to protect vulnerable groups are relatively rare globally; most often, sensitive populations are addressed by alert systems in air pollution indexes that are not constructed by legislation (as in Bangladesh, the Philippines, Sri Lanka). However, this is an issue gaining increasing global attention, as disadvantaged and sensitive populations are often exposed to higher levels of air pollution, including women who in some countries are disproportionately exposed within domestic settings to polluting cooking and heating devices (WHO 2016).

Taking into account such vulnerable groups in air quality law might be done in a number of ways, whether by enhancing protections for highly susceptible groups as a distinct regulatory category (such as children,

pregnant women, or the elderly) or by taking into account structural disadvantages in society that put certain populations at higher risk of exposure to air pollution through targeted regulatory techniques (for example enhanced air quality management for locations that contain concentrations of vulnerable groups, such as homes or schools near highly polluting roads).

In reviewing air quality laws, lawmakers should consider which populations might be particularly sensitive to air pollution risks within their country, whether due to age, illness, gender or social disadvantage. They should consider whether air quality regimes adequately address protection of these identified vulnerable populations, and if necessary recognize special duties in this regard. A notable example is seen in Australia's federal air quality law, where high-risk locations are identified for enhanced monitoring, including where there is a "large population at risk" or "particular communities where there is a relative disadvantage" (Australia, National Environment Protection (Ambient Air Quality Measure), s 41(1)).



The Special Rapporteur on the Environment has reported that certain groups are particularly vulnerable to air pollution (UNGA 2022b, 21, 61):

While all humans are exposed to pollution and toxic chemicals, there is compelling evidence that the burden of contamination falls disproportionately upon the shoulders of individuals, groups and communities that are already enduring poverty, discrimination and systemic marginalization ...

In addition to children, States should give special attention to other vulnerable or marginalized groups whose rights are jeopardized by pervasive pollution and toxic contamination, including women, Indigenous peoples, minorities, refugees, migrants, persons with disabilities, older persons, people living in protracted armed conflicts, and people living in poverty. These groups are often disproportionately affected, have fewer resources, and have less access to health-care services, increasing the risk of illness or death.



Setting legislative quality standards for ambient air

4



Setting legislative quality standards for ambient air

The setting of AAQS requires both technical and political choices, with implications for a wide range of economic and social activity (transport, industry, housebuilding, agriculture, etc.). These can be difficult choices, which require informed, political deliberation, supported by adequate scientific expertise and administrative resource. In general, AAQS should be set taking into account relevant considerations and in light of relevant objectives (**section 3**), both of which will be determined by the legislative framework empowering AAQS. The overall construction of this framework is thus very important for the effective operation of AAQS and for the delivery of clean air outcomes.

Matters to take into account in setting AAQS

Should AAQS be based on WHO guideline values?

The WHO AQGs provide the starting point for national evaluation of AAQS. As set out in **section 2**, they provide a lower limit, beneath which it is likely only modest further health benefits would accrue. The WHO guidelines also acknowledge that some countries may never be able to meet these standards due to effects of meteorology, natural events, population density or transboundary effects, but that the guidelines remain the optimal evidenced levels for public health protection.

WHO interim guideline values may be important staging posts in setting AAQS. This allows a stepped approach to achieving AAQS over time, “to guide reduction efforts towards the ultimate and timely achievement of the

AQG levels for countries that substantially exceed these levels” (WHO 2021, xvi). Legislation can provide a framework for such a phased approach to building the ambition of AAQS over time. Examples are found in South African air quality law (**section 3**) and the Israeli Clean Air Law 5768-2008.



Israel

Clean Air Law 5768-2008 (unofficial translation)

Section 6

(b)(1) The Minister may “set the air quality values for different periods and different areas”.

The role of AAQS in maintaining good air quality

AAQS are not only levels to attain in heavily polluted environments. They are also standards to be maintained once achieved, and thus sustain healthy levels of air quality over time. Legal frameworks should explicitly acknowledge this, as seen in the United States Clean Air Act.

Obligations then follow under the Clean Air Act for American states to develop plans to both attain and maintain AAQS (§110).



United States of America

Clean Air Act 1963

§109

(b) Protection of public health and welfare

(1) National primary ambient air quality standards ... shall be ambient air quality standards the attainment and maintenance of which in the judgment of the Administrator, based on such criteria and allowing an adequate margin of safety, are requisite to protect the public health.

Are concentration-based AAQS sufficient for robust standard setting?

AAQS expressed as “limit values” – maximum concentrations that should not be exceeded – are powerful because of their simplicity. Should the public be exposed to outdoor pollution above a prescribed concentration, then a standard has not been met.

Simplicity, however, comes at a cost, since the pass/fail nature of such a standard can lead to excessive policy attention being paid to a small number of non-compliant locations, an approach which may not necessarily bring the greatest benefits to public health for all. Thus, for example, governments may pay most attention to specific locations where limit values are exceeded, but little or no attention to areas where air pollution does not exceed the threshold but may be close to it. At worst, it may encourage gaming, shifting pollution from one location to another, or encourage the regulatory permitting of emissions up to the legal limit.

In light of this, countries may consider *additional and mutually reinforcing* forms of air quality standards to support public health goals. Other approaches to standards setting for ambient air quality, which may provide reinforcing regulation, include the adoption of targets for continuous improvement or limits on overall population exposure.

Many technical variants that express a broader population protection objective can be conceived of, for example:

- a target that sets a maximum limit on the number of people living in locations above a particular concentration threshold, or sets targets to reduce this value in absolute or percentage terms over time;
- a limit on the area of land surface that has air pollution above a threshold value or sets targets to reduce this value in absolute or percentage terms over time;
- a limit on the allowable accumulated amount of air pollution that is above a certain threshold, or sets targets to reduce this value in absolute or percentage terms over time;
- a population-weighted mean concentration that sets an upper limit on pollution accounting for imbalances in population density, or sets targets to reduce this value in absolute or percentage terms over time; and
- a limit on amount of accumulated exceedance of pollution above a threshold, and accounting for imbalances in population density, or sets targets to reduce this value in absolute or percentage terms over time.

These each address human exposure to pollution using different measures of success, and can help deliver air quality improvements in locations that may already meet standards for limit values. Each has its own advantages and disadvantages, but inevitably these AAQS can be more difficult to communicate and they can rely on accurate supporting data, for example on population distribution. In addition, they should be used to enhance protection for the public rather than to diminish it for any sections of the community.

An example of a population-weighted concentration average standard is seen in the CAFE Directive (as is seen in article 2 below). This is implemented within the Directive in relation to PM_{2.5} (article 15).



European Union
CAFE Directive 2008
Article 2

22. 'national exposure reduction target' shall mean a percentage reduction of the average exposure of the population of a Member State set for the reference year with the aim of reducing harmful effects on human health, to be attained where possible over a given period ...

Taking into account susceptible populations in setting AAQS

AAQS are generally set at much lower concentrations of pollution than are typically expressed in occupational health laws. In particular, they should account for:

- **the potential health impacts of pollution on highly susceptible groups, such as children, pregnant women (due to impacts on both early and late neonatal health), the elderly or those with underlying health conditions; and**
- **the fact that ambient air pollution exposure is continuous, and not limited to certain hours of a working day.**

Technical aspects of setting AAQS

Are there optimal time averaging periods?

The majority of harm from pollution arises from prolonged exposure, and annual average AAQS are therefore a suitable device to set limits that capture much of the harm created from exposure to air pollution. Standards for short-term exposure, for example limits for 24-hour average values, are often applied to directly emitted (primary) pollutants, with the most significant for health being PM_{2.5}, PM₁₀, NO₂ and SO₂. Short-term limits are very often higher than the annual average limits.

Ozone is a secondary pollutant, meaning it is formed in the atmosphere through chemical reactions, and is not directly released. It is frequently evaluated against an eight-hour average, a time period chosen to reflect its formation in air during daylight hours.

While this appears to create a potentially complex set of AAQS requirements, in practice short-term and long-term exposure are frequently closely coupled. Actions to improve attainment of one metric, generally lead to improvements in attainment in the other. Where AAQS are being introduced for the first time a simplified set of annual limits may be effective as a starting point. Virtually all countries that set AAQS have some standards based around annual mean values, and this provides a useful common metric for comparison between countries.

How should exceedances be used?

AAQS may include provisions for a certain number of allowed exceedances of short-term limits, without the relevant AAQS being considered as being breached. Some of these exceedances are justified as being caused by natural or exceptional events, while others may reflect short-term weather changes or unpredictable fluctuations in atmospheric pollution.

(a) Exceedances for natural or exceptional events

Allowance for exceedance events can be a mechanism to account for natural air pollutant events outside of national control (e.g. a certain number of days with high PM_{2.5} arising from wildfires).

A similar provision applies to PM₁₀ pollution due to the resuspension of particulates following winter sanding or salting of roads (article 21, CAFE Directive).

The exclusion of natural events, as in the CAFE Directive, requires a degree of subjective judgement to be made over whether certain events should qualify. Indeed, some national legislation may require executive approval of whether exceedances were caused by exceptional circumstances so as to be excluded from determining whether an AAQS has been breached. Such approaches run the risk of reducing transparency and confidence in AAQS systems, since decisions about permissible exceedances are undertaken on the basis of executive discretion, rather than against explicit environmental

or public health criteria. The very worst air quality events, of greatest public visibility and concern, may thus not be included in the regulatory evaluation of the delivery of clean air. Any allowable exceedances should be based on transparent and scientifically defensible environmental or public health principles, and wherever possible based on statistical evaluation rather than qualitative judgement.



**European Union
CAFE Directive 2008
Article 20**

Contributions from natural sources

1. Member States shall transmit to the Commission, for a given year, lists of zones and agglomerations where exceedances of limit values for a given pollutant are attributable to natural sources. Member States shall provide information on concentrations and sources and the evidence demonstrating that the exceedances are attributable to natural sources.
2. Where the Commission has been informed of an exceedance attributable to natural sources in accordance with paragraph 1, that exceedance shall not be considered as an exceedance for the purposes of this Directive.

(b) Generic exceedances

Other generic exceedances can be justified by short-term transient high concentrations of pollution during highly unusual adverse meteorological events (e.g. low windspeed periods coupled with a shallow atmospheric boundary layer, a combination that may “trap in” surface pollution and inhibit dilution), or high-impact events such as industrial accidents. Such events can lead to one-hour average breaches of NO₂ limits in city centres, or daily limits on PM.

The inclusion of allowances for exceedances increases the complexity of AAQS as standards, diluting the absolute ambition of AAQS and undermining public understanding of air quality that is safe for public health. Their use should be limited to what can be strictly justified. The rationale, and technical/statistical requirement for an event to be classified as an allowed exceedance, should always be clearly described. Thus, a certain number of exceedances may be allowed automatically each year to account for meteorological effects, or events may be excluded on a case-by-case basis if they are considered exceptional and could not have reasonably been foreseen and mitigated by those responsible for ensuring AAQS are met.

Other technical aspects

AAQS require transparent technical definition of the metrics being used to support equivalence in conversion between the standards as written and the observations against which they are compared. AAQS should provide working definitions of the air pollutants themselves, if they are not pure substances. The definition of PM_{2.5} and PM₁₀, and under what atmospheric conditions (e.g. humidity), should be explicitly given. The units to be used should be defined, ideally following the International System of Units, along with uncertainties. Where conversion between units is required, standard atmospheric conditions or conversion factors should be stated. There is no preferred set of technical definitions for AAQS; these can reflect local customs (metric, imperial, chemical nomenclature, etc.), but clarity is needed on any underpinning assumptions.

Reviewing AAQS

Processes for reviewing AAQS are important in light of developing scientific knowledge, increasing levels of public awareness of health impacts, and as a matter of good practice policy review. Review processes should be designed into legislative schemes to ensure they occur regularly and with adequate data and stakeholder input. Ideally, they should be geared towards achievement of an ambitious public health and environmental objective driving the legislative scheme (**section 3**). In some legal systems, such review may happen through issuing new

regulations or other secondary legislation mechanisms.

An example is seen in Eswatini’s Air Pollution Control Regulations 2010, setting out an AAQS review process linked to the obligation to monitor air quality and to a clear public health goal.



Eswatini

Air Pollution Control Regulations 2010

Section 3

(1) The Meteorological Service must monitor air quality in a range of areas which are representative of typical population exposure in order to assess compliance with the air quality objectives on a national basis.

...

(5) If on the basis of the review carried out under paragraph (1) the Authority concludes that the existing air quality objectives **are not appropriate and adequate to ensure a high level of protection for the environment and for human health**, the Authority must propose new air quality objectives to the Minister, which may apply to pollutants already listed in Schedule One or to any other pollutants not yet listed, or to both.

Israel’s Clean Air Law requires a review of air quality values at regular intervals.



Israel

Clean Air Law 5768-2008 (unofficial translation)

Section 6

(d) The Minister shall examine, from time to time, and at least once every five years, the need to update the air quality values that they set.

The Philippine Clean Air Act of 1999 sets out a more general provision for reviewing air quality legislation each year. Note there is no express obligation on Congress to respond.



Philippines

Clean Air Act of 1999

Section 52. Report to Congress

The Department shall report to Congress, not later than March 30 of every year following the approval of this Act, the progress of the pollution control efforts and make the necessary recommendations in areas where there is need for legislative action.



Fields burning in Eswatini. © Unsplash/Patrick Konior.

Administrative frameworks for compliance with legislative AAQS: Monitoring, data and zoning

5



Administrative frameworks for compliance with legislative AAQS: Monitoring, data and zoning

Promoting compliance is key in a robust system of air quality governance. Unlike other areas of law and regulation, compliance with AAQS is not simply a matter of acceptable conduct on the part of a regulated individual in line with an applicable obligation. Since air quality is a collective problem arising from many sources and behaviours, compliance is largely determined through large scale data gathering, and active management of areas in which diffuse pollution manifests. For this reason, monitoring air quality and high-quality data are central to the effective operation of air quality regimes, alongside structures for delimiting or organizing areas in which air quality is managed (through zoning).

Monitoring air quality

How should compliance with AAQS be evaluated?

The cornerstone of assessment of compliance with legal standards should be fixed observations of ambient air quality, made long-term (meaning over multi-year timescales), and using calibrated and metrologically traceable methods of measurement (unbroken chain of calibrations). It is impossible to observe air quality in all locations simultaneously and so a framework for **representative measurement** should be established that reflects typical population exposure in that country. Representative measurements to evaluate AAQS are likely to need to span a range of geographies and environments, from polluted locations near industrial sources or roadsides, through to urban and suburban locations, and also including the rural background.

Monitoring networks that evaluate compliance with AAQS have to balance many competing factors. They must be defensible in their geographic and population representativeness; they must be sustainable technically over multi-year periods, and they must reflect the pollutants of greatest concern. Observations can potentially be delivered through multiple mechanisms, as networks of instruments run directly by a government department, delegated to local bodies or environmental protection agencies, or commercially contracted out. Indeed, a national observation system may comprise a blend of all of these.


Since all measurements come with **uncertainties**, how these are to be handled needs defining within the wider AAQS framework. A limit value set in law will very likely be a precise whole number value, but the measurement data against which it is tested will almost certainly not be. As discussed earlier with regards to definitions and units, there is no single “right answer” for how to treat issues like averaging, numerical rounding, errors and uncertainty. With definitions, it is good practice to include data-handling protocols (e.g. number of significant figures to be used in reporting) within a legal framework to support transparency and provide a common basis for interpretation. It would be considered good practice for methodologies to be sufficiently clearly described that any competent third party could recreate independently the translation of “raw” monitoring data into the final assessment of compliance against a legal standard.

Importance of legal requirements to monitor air quality

Because identifying any breach of an AAQS is only possible through physical monitoring of ambient air quality, monitoring is an essential element of a robust scheme of ambient air quality governance. Setting a monitoring requirement in law ensures this critical element is embedded within air quality regimes. Usually, this legal requirement will be imposed on the state (i.e. the relevant level of government), since air quality measurements by individual operators will not be representative. The state also has the capacity to make monitoring results immediately and publicly available (and accessible), in line with environmental information requirements (**section 7**).

Some legislative requirements will set out only a bare requirement to conduct monitoring, such as to “do all things necessary to monitor air pollution”. This kind of

requirement creates a basic monitoring obligation, but does not give any indication of how that monitoring should be done. Ultimately, there is no single technical definition of what an effective monitoring infrastructure should be comprised of. However, the interpretation of such legislative requirements by officials should involve consideration of key factors relating to optimal control of public health through AAQS. For example, are all major population areas serviced by monitoring, are those monitors located in representative locations, are the most important pollutants being monitored? Legislative schemes can explicitly provide for some of these considerations. As the subsections below indicate, this Guide recommends that lawmakers consider more detailed specifications in constructing legal monitoring requirements to ensure useful data is procured to underpin an effective air quality regime.

Some countries give an indication of the standard of monitoring to be conducted in general terms. 



Jordan

Environment Protection Law of 2017

Article 4

The Ministry shall undertake, in cooperation and coordination with the relevant authorities, the following functions and powers:

...

*M – Monitoring the elements of the environment and measuring components through scientific centres and laboratories that are accredited for this purpose **in accordance with the international guidelines and specifications** and to establish and operate the environmental monitoring networks.*



Examples of guidelines and specifications for conducting air quality monitoring include those set out by the European Committee for Standardization, which produces detailed guides for each of the air quality pollutants included in the CAFE Directive. As an example, measurement of nitrogen oxides using the analytical method of chemiluminescence is described in the European standard BS EN14211:2012 on ambient air. Similarly detailed guidance on measurement is given in other countries, for example issued by the United States Environmental Protection Agency (Watson *et al.* 1997). There are also international advisory guidelines on air quality measurements issued by the WMO, for example on the use of small sensors (Peltier *ed.* 2022), and by the Bureau International des Poids et Mesures (International Bureau of Weights and Measures) for the calibration constants to be used when measuring specific pollutants such as ozone (Hodges *et al.* 2019).

The laws of other countries again contain general obligations that refer to national bodies which will provide appropriate technical guidance on monitoring methods.

A major challenge for many countries concerns the cost and resources required to deliver on these legal monitoring requirements, which may require support from capacity-building schemes as well as political and budgetary prioritization. Incremental development

of high-quality monitoring sites over time may be the most feasible option in some countries. Building this data gathering capacity is a core aspect of a robust air quality regime, even if there are significant challenges to achieving this.

Article 27 of the Swiss Ordinance on Air Pollution Control thus provides:



Switzerland

Ordinance on Air Pollution Control 1985 (courtesy translation by the Swiss Confederation)

Article 27. Determination of ambient air pollution levels

1. *The cantons shall monitor the air pollution situation and trends in their territory; in particular, they shall determine ambient air pollution levels.*
2. *To this end, they shall carry out surveys, measurements and dispersion modelling. The [Federal Office for the Environment] shall recommend suitable methods.*

Level of government responsible for monitoring

Particularly in countries with federal or devolved systems of government, there should be a clear delineation of which level of government is responsible for air quality monitoring, and how this obligation links coherently to obligations to collate and disseminate data, and to achieve AAQS or otherwise improve air quality. Where monitoring obligations are imposed at multiple levels of government, it should be clear what the different purposes of those potentially overlapping monitoring obligations are, how any differences in interpretation of data are to be resolved and how air quality monitoring is to be coordinated. Where monitoring is undertaken by different bodies, possibly for different purposes, there should still be close technical equivalence in methodology, data quality requirements, and traceability of calibration for those instruments used for monitoring. National governments must also meet any international responsibilities to monitor air quality treaties through

allocating, coordinating and overseeing monitoring functions throughout the relevant country.

An example of the legislative allocation of related monitoring, data-collection and management responsibilities as between federal and state authorities is seen in India's Air (Prevention and Control of Pollution) Act, 1981.

While the responsibilities overlap to some extent, the State Board is focused more on local monitoring of air pollution and assessment in high-risk areas ("air pollution control areas"), while the national Central Board has responsibility for providing overview data on air quality, including statistical analysis, for the country as a whole. In performing these roles, coordination of data-collection methods and data-sharing across the boards will be important to ensure that useful air quality data is produced, for regulation and policymaking as well as for informing the public.



India

Air (Prevention and Control of Pollution) Act 1981

16. Functions of Central Board

- (2) (g) collect, compile and publish technical and statistical data relating to air pollution and the measures devised for its effective prevention, control or abatement and prepare manuals, codes or guides relating to prevention, control or abatement of air pollution;

17. Functions of State Board

...

- (5) (c) to collect and disseminate information relating to air pollution;

...

- (f) to inspect air pollution control areas at such intervals as it may think necessary, assess the quality of air therein and take steps for the prevention, control or abatement of air pollution in such areas;

Location requirements for monitoring air quality

The representativeness and usefulness of monitoring data will depend on how well located monitoring stations are. Monitoring stations will most likely be fixed long-term in one location, although this does not preclude the use of portable monitors to assess short-term (e.g. hourly or daily) AAQS. The siting criteria for fixed monitoring stations should be unambiguous: for example, measurements aiming to represent roadside locations must include a prescribed distance from the edge of the road, and height at which measurements are made. Their number and location will be particularly important, and legislative frameworks can prescribe location requirements to ensure that monitoring is robust.

Key questions to consider are:

- How many monitoring stations are required?
- Where exactly should they be located to gather useful information?
- At what height should they be placed to capture the quality of air that people breathe?

The precise answers to these questions will depend upon a country's topographical, urban and weather conditions, as well as population sensitivities. In general, even in well-resourced countries, it is unusual to have density of observations greater than one monitoring site per 100,000 population, and in many countries a single observing site may provide the AAQS evaluation for far greater numbers.

Detailed location specifications can have legal consequences. This will depend on a country's legal culture, but some case law has emerged interpreting legal monitoring requirements in light of public health objectives of air quality law.



In 2019, CJEU held that, under European Union law, the siting of sampling points is a matter for judicial review. The location of sampling points is central to the air quality monitoring system provided for the European Union legislation, the very purpose of which would be compromised if sampling points were not correctly located. National courts are thus required to ensure that all necessary measures are taken so that sampling points are sited in accordance with applicable legal criteria (*Case C-723/17 Lies Craeynest and Others v Brussels Hoofdstedelijk Gewest and Another* 2019).

An example of national legislation setting out specific monitoring requirements is seen in Türkiye's Air Quality Assessment and Management Regulation.



Türkiye

Air Quality Assessment and Management Regulation 2008 (unofficial translation)

Annex II

A) Location of sampling points.

In fixed measurements, the following points are followed.

Macro-scale localization for SO₂, NO₂, lead, PM₁₀, benzene, CO, arsenic, cadmium, nickel, mercury and polycyclic aromatic hydrocarbons

(1) Protection of human health

The locations of sampling points for the protection of human health are determined the following purposes;

(i) to provide data in areas within “zones” and “subzones” where the highest concentrations occur where the population is likely to be indirectly or directly exposed for a significant period of time in relation to the average duration of the limit value(s);

(ii) to provide data on levels in other areas within “zones” and “subzones” representing the exposure of the general population;

(iii) to provide data on the accumulation rates of arsenic, cadmium, mercury, nickel, benzo(a)pyrene and other polycyclic aromatic hydrocarbons, which will represent the indirect exposure of the population through the food chain.

Sampling points are often placed in such a way that the measurement of the nearest very small micro-environments is avoided ...

Where contributions from industrial sources will be evaluated, at least one sampling point is placed in the wind direction of the source in the closest residential area. ...

(2) Conservation of ecosystems and vegetation

Sampling points aiming at the protection of ecosystems and vegetation are located more than 5km from other built areas, industrial facilities or highways, or more than 20km from the “subzones”. For the sake of guidance, a sampling point is placed so that it can represent the air quality in an environment of at least 1,000km². ...

Ensuring confidence in data used for compliance

The quality of data used to assess compliance with AAQS is crucial for air quality regimes to operate effectively. Data must be of sufficient robustness and quality that it can act as the basis of legal challenge. Public confidence in data is critically important given that only a finite and likely limited number of monitoring locations will be taken as being representative of a country as a whole. Measurements should be open to scrutiny and deliver data that transparently meets predefined data quality standards, which are expressed in appropriate units (SI International System of Units are generally preferable), and that are traceable to appropriate reference materials or measurement standards themselves ideally recognized for their international equivalence.

Where the AAQS is set as an annual average, typically a set of minimum data coverage requirements must be met before such an observational annual average value can be compared against the legal standard or limit. It is

reasonable for these provisions to define a tolerable level of missing data due to equipment failure and routine maintenance. As an example, New Zealand's Resource Management (National Environmental Standards for Air Quality) Regulations 2004 provides specific data coverage requirements for PM₁₀ before an annual average value can be generated.

The details of exactly how each individual pollutant should be measured, for instance using which analytical method or instruments, are beyond this Guide. However, whatever approach is used (and this may be defined within an AAQS), monitoring networks must be supported by a technical infrastructure that can provide support for the calibration of air quality instruments, and ensure that there is equivalence in data collected across a national monitoring network. There is likely to be a role for national metrology institutes and other laboratories participating in the Mutual Recognition Arrangement of the International Committee for Weights and Measures in supporting this infrastructure and in engendering public confidence in air quality data.



New Zealand

Resource Management (National Environmental Standards for Air Quality) Regulations 2004

Article 16C. Meaningful PM₁₀ data for airshed

(1) This regulation specifies what is required for an airshed to have meaningful PM₁₀ data under regulation 16B(2), 16D(2), or 17(4)(a)(i).

(2) An airshed has meaningful PM₁₀ data for a 12-month period if,—

(a) when the concentration of PM₁₀ in the airshed was measured during that period, it was measured in a way that allowed 24-hour mean concentrations to be calculated under Schedule 1; and

(b) the measurements captured data for at least 95% of the 12-month period, after deducting from the duration of the 12-month period any periods of time that were not covered by measurements because of maintenance or calibration; and

(c) at least 75% of the data captured was valid data.

Is there a role for air quality modelling?

Air quality modelling provides a means to estimate air quality in locations that are not monitored, and provides a valuable resource for the development of policy and for public information. Currently air quality modelling is however not generally considered suitable as the primary method for evaluating compliance with AAQS in regions where there is a substantial risk of exceedance. This is because the physics and chemistry of modelling of air pollution (and particularly PM_{2.5} and O₃) has many uncertainties, and models are highly reliant on accurate input emissions data, which may

not be available. There are some limited circumstances, for example assessment of NO₂ by a roadside, where model uncertainty is lower and they can potentially form part of a compliance regime. Modelling may be a suitable and effective way to estimate concentrations in locations that are likely to be at low risk of exceeding AAQS and where the cost of making observations would not be proportionate. Models may also supplement monitoring data to add additional granularity and insight. For example, the CAFE Directive allows air pollution assessment to be based on modelling in lieu of physical monitoring in low-risk pollution areas. For high-risk areas, modelling can be used to supplement fixed measurements:



European Union
CAFE Directive 2008
Article 6

2. In all zones and agglomerations where the level of pollutants referred to in paragraph 1 exceeds the upper assessment threshold established for those pollutants, fixed measurements shall be used to assess the ambient air quality. Those fixed measurements may be supplemented by modelling techniques and/or indicative measurements to provide adequate information on the spatial distribution of the ambient air quality.

...

4. In all zones and agglomerations where the level of pollutants referred to in paragraph 1 is below the lower assessment threshold established for those pollutants, modelling techniques or objective-estimation techniques or both shall be sufficient for the assessment of the ambient air quality.

Models are however not fixed entities and are highly sensitive to input data on emissions, meteorological fields and subcomponent mechanisms and software schemes. Changes to any of these impact on the reported level of compliance with AAQS.

Models capable of evaluating the distribution of air pollution across a whole country and over the course of a year do not typically represent air quality at very fine spatial scales, and so may not provide a direct assessment of exposure near local sources or at the roadside. They rely fundamentally on the veracity of the emission inventory being used, and any errors or omissions in this impact on assessment of compliance. Even with a highly regulated model framework, and accurate representation of emissions, model-based assessment may lack suitable transparency to satisfy public demands.

Is there a role for citizen science or other actors in supporting monitoring?

In recent years, there have been major technological developments in simple methods for the measurement of air pollution, sometimes referred to as “low-cost sensors”, or perhaps more accurately, “small sensors”. Such sensors can empower individuals and community organizations to measure air quality in their own neighbourhoods. They provide a degree of agency and can play a critical role in community engagement, particularly in alerting authorities to local issues.

At the time of this Guide’s publication, measurements with small sensors are unlikely to meet suitable data quality standards for compliance assessment, either via their calibration or in terms of meeting wider standardized criteria around siting locations, time averaging, stability and so on. Thus, they should not have a primary role in the evaluation of compliance with AAQS, without official endorsement. There are risks that citizen science using sensors could over- or understate true air pollution concentrations. However, this is a

fast-moving area of technology, and data quality from sensors, at least for PM_{2.5}, is improving, and the role of sensors in AAQS is likely to evolve in coming years. In the future, it is possible that privately commissioned or operated air quality sensors may provide a suitable standard of evidence to demonstrate non-compliance with AAQS. Legislation on AAQS should be sufficiently flexible to accommodate challenge from any technology source that meets appropriate data quality standards.


Role of international and academic institutions in supporting monitoring

A range of sources of information might support governments in identifying pollution problems. This will be particularly important where national resources and technical capacity for air quality monitoring are limited. Supplementary sources may include data gathered by international organizations (e.g. the WMO Bulletin) and academic institutions, as well as data from emerging technologies, including sensors (see previous subsection), and, for some pollutants, from the use of satellites. There are also several open-source global air quality forecasting resources available that include assimilation of data from Earth Observation. While sometimes these are limited in spatial resolution, they nonetheless provide valuable information on regional and national-scale pollution, particularly for PM_{2.5} and O₃. See, for example, the Copernicus Atmosphere Monitoring Service from the European Centre for Medium Range Weather Forecasting, and the Goddard Earth Observing System model from the NASA Global Modeling and Assimilation Office.

Furthermore, collaboration between government, universities, United Nations entities, foreign embassies and community groups may provide a pragmatic approach to delivering measurements that inform all parties on progress towards attainment of AAQS. Examples of this are seen in India (collaboration with universities) and Nepal (collaboration with universities, and support from international organizations and development agencies).

Zoning requirements

In evaluating and promoting compliance with AAQS, zoning of geographical areas can be a useful regulatory device. Unlike problems that can be caused by restricting the scope of AAQS to certain geographical areas (**section 3**), there are good reasons for establishing zones in legislative frameworks for monitoring AAQS, and for developing related management strategies.

The air quality regime of the European Union is an example of an air quality regime that uses zoning as the basis of monitoring and management, with “zones and agglomerations” covering all geographical territory within Member States and establishing the representativeness of any given measurement used for assessment. 



European Union CAFE Directive 2008

Article 2

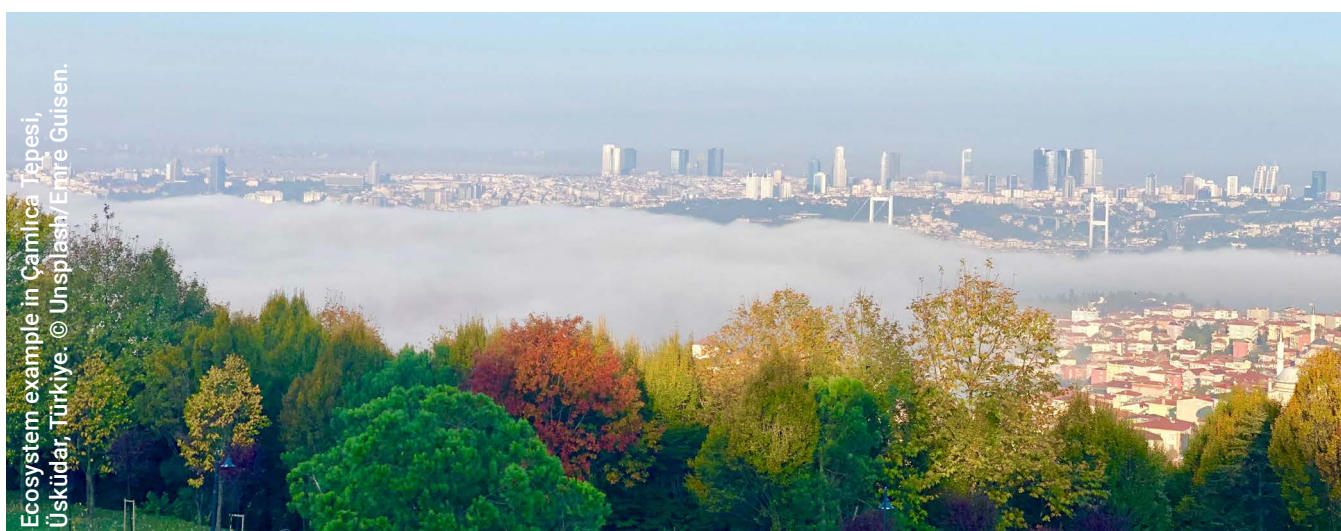
16. “zone” shall mean part of the territory of a Member State, as delimited by that Member State for the purposes of air quality assessment and management;

17. “agglomeration” shall mean a zone that is a conurbation with a population in excess of 250 000 inhabitants or, where the population is 250 000 inhabitants or less, with a given population density per km² to be established by the Member States;

...

Article 6

1. Member States shall assess ambient air quality with respect to the pollutants referred to in Article 5 in all their **zones and agglomerations** ...



Ecosystem example in Çamlıca Tepesi, Üsküdar, Türkiye. © Unsplash/Emre Guisen.

In relation to air quality management in particular, specific zones may be identified and legally designated for enhanced management obligations. These areas are usually designated where there are breaches of AAQS, and may be referred to as “air quality management areas”, “controlled areas”, “air pollution-impacted areas”, etc.

In designing such zones within legislative regimes, the effectiveness of legal powers allocated to manage them once they have been declared must be assessed. The powers of the relevant authority charged with managing the zone must be adequate for the task of improving or maintaining air quality, or otherwise supported by

coordination processes. In particular, local government authorities, often charged with managing such zones, may not always have necessary powers to prevent exceedances without coordinated action by other public authorities, since air pollution arises from a wide range of sources that may be beyond their direct regulatory control (**section 8**). Similarly, where powers to manage designated zones are restricted (e.g. where powers to act within designated air pollution control areas are limited to restricting use of certain fuels and appliances), such restrictions should be based on evidence about effective management strategies for potentially designated areas within that country.



Israel

Clean Air Law 5768-2008 (unofficial translation)

Section 11. Declaration of an air pollution-impacted area

(a) If the Minister concludes that in a certain area environmental values are continuously or frequently being exceeded or that there is excessive air pollution, then they shall declare that area, by order, as an air pollution-impacted area

...

Section 12. Undertaking measures in air pollution-impacted area

*(a) Where the Minister has declared an area as an air pollution-impacted area, then the authority in the air pollution-impacted area, with more than 30,000 inhabitants registered in the population register, shall prepare a programme of action for undertaking measures within its bounds, **within the scope of its powers** to improve air quality **and prevent a recurrence of the exceedance of ambient air quality values**, as the case may be ...*

Compliance and enforcement measures

6



Compliance and enforcement measures

One of the key reasons for embedding AAQS in legal regimes is to ensure that they are complied with, enforcing them through legal means if necessary. If reliable data demonstrates that AAQS are not being met, there should be legal consequences for this breach of the law. The exact nature and form of those consequences will depend on how legal breaches are resolved within specific legal cultures, but they will also depend on how those legal consequences are defined within air quality legislation. Due to the collective nature of air quality problems, there is not an obvious or automatic legal remedy for breaches of AAQS – they are rarely transgressions by one individual who can be directly sued or prosecuted. Legislative regimes should thus explicitly set out the regulatory consequences if AAQS are not met. These consequences will normally involve obligations on the state to take action, in light of its coordinating function and unique ability to address collective action problems.

Immediate legal consequences for enforcing AAQS will have implications for a range of supporting or interacting sectoral regulation in “enforcing” good air quality. Different areas of regulation and policy should be coordinated to ensure overall compliance with AAQS. This regulatory coordination challenge is addressed in **section 8**.

State responsibility for meeting AAQS

This section outlines a range of obligations that might be imposed on governments for failing to achieve AAQS – from strict legal responsibility and obligations to develop effective plans, to obligations that encourage the state to take action. In designing air quality laws, strong compliance mechanisms requiring action by government will support a robust and ambitious system of air quality governance in light of the collective nature of air pollution problems.

Direct legal responsibility on governments to achieve AAQS

The strongest form of legal accountability for achieving AAQS is a binding legislative obligation on the state to

achieve the standards, either immediately or by a given deadline consistent with the purpose of the legislation. An immediate obligation to achieve AAQS is the most ambitious obligation implementing public health goals through air quality legislation. Where there is a future deadline for achieving AAQS, the timing of this should be suitably ambitious to ensure that public health goals are driven on by the legislative framework as soon as feasibly possible to protect public health. The rationale for any extended deadlines should be transparent and consistent with the purpose of the legislation. In this respect, the interim air quality guidelines may be useful benchmarks for countries progressing towards AAQS in line with the WHO AQGs on a defined policy or legal timetable. An example of a clear and ambitious obligation on governments to achieve AAQS is seen in the European Union CAFE Directive.



European Union CAFE Directive 2008

Article 13. Limit values and alert thresholds for the protection of human health

1. Member States shall ensure that, throughout their zones and agglomerations, levels of sulphur dioxide, PM₁₀, lead, and carbon monoxide in ambient air do not exceed the limit values laid down in Annex XI. In respect of nitrogen dioxide and benzene, the limit values specified in Annex XI may not be exceeded from the dates specified therein.

The advantage of such unequivocal, binding obligations on governments to achieve AAQS is that they can facilitate strong legal enforcement by courts. Individuals and public interest groups globally have been motivated to bring legal actions concerning non-compliance with AAQS (**section 7**), providing opportunities for legal interpretation of such obligations. In relation to the European Union, the CJEU has repeatedly interpreted article 13 as an “obligation of result” that must be met by states without excuse.



An early case confirming the legally binding nature of AAQS under the European Union CAFE Directive was Case C-404/13 R (*ClientEarth*) v Secretary of State for the Environment, Food and Rural Affairs (2013), which concerned breaches of NO₂ limits in the United Kingdom of Great Britain and Northern Ireland:

30. [I]t should be noted that while, as regards sulphur dioxide, PM₁₀, lead and carbon monoxide, the first subparagraph of Article 13(1) of Directive 2008/50 provides that Member States are to 'ensure' that the limit values are not exceeded, the second subparagraph of Article 13(1) states that, as regards nitrogen dioxide and benzene, the limit values 'may not be exceeded' after the specified deadline, which amounts to an **obligation to achieve a certain result**.

31. Consequently, Member States must take all the measures necessary to secure compliance with that requirement.

Similar interpretation of the obligations relating to other limit values in article 13 is found in a now established body of CJEU case law enforcing the article 13 obligation against

Member States, for instance in Case C-488/15 *Commission v Bulgaria* (2017) and Case C-638/18 *Commission v Romania* (Exceedance of limit values for PM₁₀) (2020).



In Case C-644/18 *Commission v Italy* (2020), the Court stressed the public health and environmental protection goals of the CAFE Directive in supporting a strict interpretation of the obligations on states to achieve AAQS, highlighting the importance of clear legislative objectives (**section 3**) in informing statutory interpretation in this legal culture:

69 [I]t should be noted that, as set out in Article 1(1) of Directive 2008/50, that directive lays down measures aimed at defining and establishing objectives for ambient air quality **designed to avoid, prevent or reduce harmful effects on human health and the environment as a whole**. In that context, the first subparagraph of Article 13(1) of that directive provides that the Member States must ensure that, throughout their zones and agglomerations, levels of PM₁₀, in particular, in ambient air do not exceed the limit values laid down in Annex XI to that directive.

...

75 [A]s is apparent from the very definition of 'limit value' in Article 2(5) of Directive 2008/50, that value must, **in order to avoid, prevent or reduce harmful effects on human health and/or the environment as a whole**, be attained within a given time limit and not be exceeded once attained.

...

87 [I]n the absence of proof adduced by the Italian Republic of the existence of exceptional circumstances whose consequences could not have been avoided despite all the steps taken, it is irrelevant whether the failure to fulfil obligations is the result of intention or negligence on the part of the Member State responsible, or of technical or structural difficulties encountered by it.

By contrast, some legal obligations to “meet” AAQS may be less stringent in their legislative construction (e.g. requiring “best practicable means”, or “reasonable efforts” or similar to meet AAQS), allowing policy trade-offs to compromise achieving air quality standards or delay in taking action. This kind of legislative drafting frames AAQS in ways that are less amenable to strict judicial enforcement of those standards, and undermines a robust system of air quality governance that prioritizes public health outcomes.

‘Individualized’ modes of responsibility

Obligations to achieve AAQS imposed on the state should be contrasted with obligations imposed on individual operators alone. Some countries effectively delegate legal responsibility for achieving AAQS to individual operators, such as through obligations to ensure that industrial plants do not cause AAQS to be breached in areas where they are permitted to operate. Such individualized obligations are useful in alerting highly polluting industries to their emission contributions in relation to AAQS, and they often fit more neatly within regulatory cultures that regulate environmental pollution primarily through the permitting of individual operators. However, such obligations are limited in capturing the collective nature of ambient air pollution problems, which arise from combined primary and secondary sources, and they risk being ineffective in achieving compliance with AAQS. Countries should review whether any such obligations are adequately supported by obligations on the state to achieve AAQS.

An accommodation between individualized and state obligations to meet AAQS is seen in article 9 of Switzerland’s Ordinance on Air Pollution Control. This requires authorities to impose stricter emission limits on an individual installation where it alone is causing excessive ambient air pollution levels. However, where excessive levels are caused by more than one installation, more wide-ranging planning obligations are required (as set out in the following subsection).

Management measures to meet AAQS: the role of air quality planning obligations

In addition to clear legislative obligations to meet AAQS, another potentially effective legal consequence for breaches of AAQS are obligations on the state to plan to meet AAQS. These are obligations that require an administrative planning process to be set in motion to develop detailed actions for the achievement of AAQS. The main advantage of such an obligation is that it requires governments to set up a dedicated administrative process to tackle air pollution problems. If not well implemented, however, there are risks that such planning processes can lead to delays in making policy changes to address air pollution, or that they lead to compromised or short-term approaches to addressing air pollution. The precise construction of planning obligations will impact how effective they are, in addition to resources and political will needed to support such planning processes. Meaningful public participation in developing air pollution plans is also important (**section 7**).

An example of a legislative planning obligation is seen in Switzerland’s Ordinance on Air Pollution Control. This provision contains a targeted planning obligation for excessive emissions that arise despite emission limits, requiring the effectiveness of proposed measures to be appraised, allocating responsibility for adopting measures, and opening up space for new legal powers to be introduced if required. It also requires plans to be put into effect, not simply drawn up, within a limited time period, and regularly reviewed for their effectiveness and updated if required. Note that this planning obligation is limited to excessive emissions arising from stationary sources and traffic.



Switzerland

Ordinance on Air Pollution Control 1985 (as amended, official translation)

Article 31. Preparation of an action plan

The authorities shall draw up an action plan in accordance with Article 44a of the Act if it has been established or is to be expected that, in spite of the preventive limiting of emissions, excessive ambient air pollution levels are caused by:

- a. an item of transport infrastructure;
- b. a number of stationary installations.

Article 32. Content of the action plan

1 The action plan shall indicate:

- a. the sources of emissions which are responsible for causing excessive ambient air pollution levels;
- b. the significance of individual sources of emissions for the total pollution load;
- c. measures for reducing and eliminating excessive ambient air pollution levels;
- d. the effects of the various measures;
- e. the legal framework existing or yet to be established for the various measures;
- f. time limits for the ordering and implementation of the measures;
- g. the authorities responsible for enforcement of the measures.

2 Measures under paragraph 1 letter c are:

- a. for stationary installations: shorter time limits for retrofitting or additional or stricter emission limits;
- b. for transport infrastructure: structural, operational, traffic management or traffic restriction measures.

Article 33. Putting the action plan into effect

1 The measures contained in the action plan are generally to be put into effect within five years.

2 As a matter of priority, the authorities shall order measures for installations that account for more than 10% of the total pollution load.

3 The cantons shall regularly review the effectiveness of the measures and shall amend the action plans if necessary. They shall inform the public accordingly.

The Swiss example can be contrasted with the planning obligation under the CAFE Directive, which is a more holistic obligation, clearly focused on achieving AAQS, and which includes provisions for sensitive groups.

A strong advantage of this planning obligation has been to impose significant pressure on Member State governments through litigation requiring governments to develop compliant and viable air quality plans.



European Union

CAFE Directive 2008

Article 23. Air quality plans

1. Where, in given zones or agglomerations, the levels of pollutants in ambient air exceed any limit value or target value, plus any relevant margin of tolerance in each case, Member States shall ensure that air quality plans are established for those zones and agglomerations **in order to achieve** the related limit value or target value specified in Annexes XI and XIV.

In the event of exceedances of those limit values for which the attainment deadline is already expired, the air quality plans shall set out appropriate measures, **so that the exceedance period can be kept as short as possible**. The air quality plans may additionally include specific measures aiming at the protection of sensitive population groups, including children.

Those air quality plans shall incorporate at least the information listed in Section A of Annex XV and may include measures pursuant to Article 24. Those plans shall be communicated to the Commission without delay, but no later than two years after the end of the year the first exceedance was observed.



In the United Kingdom of Great Britain and Northern Ireland, repeated cases found that air quality plans produced by the Government were legally inadequate and needed to be rewritten as lawful plans. This litigation was dependent on the clear, binding legislative wording to develop a plan that keeps exceedances ‘as short as possible’.

See *R (ClientEarth [No. 2]) v Secretary of State for the Environment, Food and Rural Affairs* (2016), and *R (ClientEarth [No. 3]) v Secretary of State for the Environment, Food and Rural Affairs, Secretary of State for Transport, and Welsh Ministers* (2018).

Nonetheless, this European Union law obligation has faced implementation challenges in European Union Member States (see European Commission 2019) and is not always effectively driving policy and regulatory change towards compliance with AAQS in as short a time frame as required. Amendments to the CAFE Directive are

expected to address its limitations. Part of the challenge for governments may arise from poor coordination across multiple national air quality planning obligations, including separate planning processes for compliance with emissions ceilings agreed internationally (**section 8**).

Emergency planning obligations

Obligations to plan to address breaches of AAQS should be contrasted with emergency planning responses when air quality reaches hazardous concentrations. Such obligations are important to compel the government to take action when there is imminent harm to vulnerable populations.



United Republic of Tanzania

Environmental Management (Air Quality Standards) Regulations 2007

Section 26

- (1) *An environmental inspector who observes or receives information on emission into the environment in an amount, concentration or manner that constitutes a risk to human health or environment, may serve an emergency prevention order.*
- (2) *A prevention order shall require a person against whom it is made to –*
- (a) create and forward to the Council a written emergency response plan that is adequate to reduce or eliminate the risk;*
 - (b) have any necessary equipment, facilities and trained personnel available to deal with the risk; and*
 - (c) take whatever other measures which may be necessary to ensure that any emergency can be effectively responded to.*
- (3) *A person on whom a prevention order is served shall comply with the requirements of the order by the date or dates specified in the order and where no date is specified, that person shall comply with the order immediately.*

Reporting obligations

Another legal consequence that can follow from breach of AAQS is the requirement to report on breaches to an official body, such as a government agency or parliament. This can be a useful regulatory device to hold governments to account through political means and through transparency to the public.



Australia

National Environment Protection (Ambient Air Quality) Measure 2016

Article 18. Reporting

(1) Each participating jurisdiction must submit a report on its compliance with the Measure, other than in relation to table 2 of Schedule 2, in an approved form to Council by the 30 June next following each reporting year.

(2A) ... The report must include:

- (a) the evaluations and assessments mentioned in clause 17; and
- (b) an analysis of the extent to which the standards of this Measure are, or are not, met in the jurisdiction; and
- (c) a statement of the progress made towards achieving the goal.

(3) The description of the circumstances which led to exceedances, including the influence of natural events and fire management, must be reported to the extent that such information can be determined.

(3A) When reporting against PM₁₀ and PM_{2.5} 1 day average standards jurisdictions will report all measured data, including monitoring data that is directly associated with an exceptional event, and identify and describe any exceptional event.

(3B) Participating jurisdictions are to maintain and make available records relating to the determination of exceptional events.

(3C) For the purpose of reporting compliance against PM₁₀ and PM_{2.5} 1 day average standards, jurisdictions shall exclude monitoring data that has been determined as being directly associated with an exceptional event.

(3D) For the purpose of reporting compliance against PM₁₀ and PM_{2.5} 1 year average standards, jurisdictions shall include all measured data, including monitoring data that is directly associated with an exceptional event.

Note: To ensure national consistency, all reporting or record-keeping referred to in subclauses 18(3A), (3B), (3C) or (3D) shall be undertaken in accordance with any procedures or methods agreed by participating jurisdictions.

(4) A report for a pollutant must include the percentage of data available in the reporting period.

Enforcement and sanctions for breaching air quality law

In designing air quality laws, lawmakers should ensure that legislative provisions are drafted in such a way that they are enforceable. All legislative provisions in a system of air quality governance should entail clear legal obligations, including what is required to be done and who is required to perform the relevant obligation. For example, setting out AAQS in a legal instrument but not imposing an obligation on any party for meeting those standards undermines the enforceability of those legislative standards.

Once legal obligations arising from breaches of AAQS are clearly set out in air quality legislation, these obligations will require enforcement mechanisms or sanctions to support their implementation. Similarly, other vital obligations of air quality governance, such as monitoring obligations, will need to be supported by viable avenues of legal enforcement.

Since attainment of these standards or obligations will usually require action on the part of public authorities, in light of the collective nature of air pollution problems, enforcement against government actors will often need to be considered. This may give rise to challenges in some legal and constitutional cultures where legal enforcement against government actors is not common or even recognized, since the state would act as both enforcer and the body being enforced against. Countries should review their constitutional and public law doctrines and any specific enforcement mechanisms within applicable air quality regimes to determine whether there are adequate avenues for the effective legal enforcement of AAQS and related air quality obligations, supported by judicial intervention as required. Legal doctrine may need to evolve to provide effective enforcement mechanisms.

Across air quality regimes globally, there are at least three different avenues for enforcement relating to breaches of AAQS obligations (UNEP 2021a, 71–72):

- **multilevel government mechanisms;**
- **direct enforcement against nation states; and**
- **direct enforcement against individuals.**

A country's legal and political structures will determine which avenues are most appropriate in that country. In all cases, however, institutional capacity and resources will be critical for effective enforcement, in terms of both legal and regulatory capacity, and technical expertise to support enforcement actions.

Multilevel government enforcement mechanisms

Certain federal states or systems of multilevel governance often have an advantage in enforcing AAQS obligations. This is because the higher level of government can often act as an effective enforcement body for AAQS obligations applying to the lower level(s). Under the United States Clean Air Act §7509, for example, the federal Government thus can impose a range of sanctions on states where they fail to develop appropriate plans or undertake other duties in relation to areas that breach AAQS. The enumerated sanctions are specific to the constitutional context in the United States of America, but are spelled out clearly in the Act – including “highway sanctions” (preventing approvals for new highway projects), applying strict offset requirements to certain permitted installations, or issuing a “notice of failure to attain” triggering more intensive planning requirements.

Another mode of enforcing air quality standards in a multilevel system of government is for the higher level to issue directions to the lower level requiring specific action. An example is seen under the article 28(2) of the Japanese Air Pollution Control Act 1968, whereby the Minister of the Environment may, when considering it urgently necessary to prevent damage to human health from air pollution, issue instructions to take action to the prefectural governor or to the mayor of a city (including special wards) specified by a cabinet order.

Courts also play an important role in enforcing air quality obligations in a multilevel system of government. This is well illustrated by the mechanism of European Union infringement proceedings, whereby the European Commission can enforce breaches of air quality obligations on the part of European Union Member States by bringing CJEU proceedings against delinquent states. As noted above, the CJEU has become very strict in enforcing European Union air quality law in such actions.



The CJEU has confirmed that, in European Union law, AAQS framed as limit values under the CAFE Directive amount to obligations to achieve a result, binding on Member States to reach within a given period, and subsequently to maintain that result (Case C-644/18 *Commission v Italy* 2020). Moreover, where national courts have powers to detail public officials, they are required to exercise these powers where national authorities persistently refuse to comply with clear, binding air quality obligations (Case C-752/18 *Deutsche Umwelthilfe* 2019).

Direct enforcement action against nation states

Bringing action against the government for breaching AAQS obligations within a nation state will depend on the constitutional law of the state and its public law doctrines. Many countries will have distinctive public law doctrines for constitutional, judicial or administrative review, although judicial review in particular is usually a process concerned with legality of public action rather than enforcing obligations owed by the state.



On 4 August 2021, the Conseil d'Etat of France (the higher administrative court) imposed on the French State a fine of 10 million euros in light of the Government's failure to adopt as soon as possible the appropriate measures to reduce exceedances of AAQS on NO₂ and PM₁₀ (*Amis de la Terre*, 2021). The court held that this fine could be levied repeatedly every six months if the Government remained in breach of air quality standards. The initial payment was made to the non-governmental organizations and to several public institutions dealing with air quality, in relation to health aspects and monitoring.

Employing such domestic public law doctrines, there are some interesting examples emerging of national courts holding national governments to account for their AAQS obligations using the judicial powers at their disposal to enforce clear legal obligations on the state.

Other legal cultures have legal doctrines that facilitate direct action against the government for environmental harms. Thus, for example, the United Republic of Tanzania's Environmental Management Act 2004 outlines a civil *actio popularis* which may apply to breaches of AAQS.



United Republic of Tanzania Environmental Management Act 2004 Section 5

(2)(b) [Every person has a right to bring an action to, *inter alia*] compel any public officer to take measures to prevent or discontinue any act or omission, which is likely to cause harm to human health or environment.

Similarly constitutional rights may support effective air quality regimes through rights to a healthy environment, as seen in the constitutional reasoning of South African and Brazilian courts in air quality cases.



On 18 March 2022, the High Court of South Africa (Trustees for the time being of *Groundwork Trust and Another v Minister of Environmental Affairs and Others* 2022) declared that poor air quality in a certain area breached residents' constitutional right to an environment that is not harmful to their health and well-being. It ordered the urgent improvement, management, and maintenance of the air quality monitoring station network to ensure that verified, reliable data are produced, and that real-time emissions data are publicly available online and on request.

Another example is seen in Brazil (*Procurador-Geral Da República and Others v Presidente do Conselho Nacional do Meio Ambiente* 2022), where the Deputy Attorney General filed a Direct Action for Unconstitutionality action, denouncing the unconstitutionality of the National Council of the Environment (CONAMA) Resolution 491/2018 establishing new AAQS. This claim was based on the Resolution's alleged weak levels of protection and insufficient contribution to the constitutional right to a healthy and balanced environment and to the obligation to disclose environmental information to the population. On 5 May 2022, the Federal Supreme Court declared that:

although there is no defect of unconstitutionality [in Resolution 491/2018] ... within 24 months from the publication of this decision, CONAMA must issue a new resolution on the matter, which must take into consideration:

- (i) the current WHO guidelines on appropriate air quality standards;*
 - (ii) the national reality and local peculiarities; and*
 - (iii) the principles of free enterprise, social development, poverty reduction and promotion of public health;*
- [furthermore], after the 24-month period granted above has elapsed, without the issuance of a new act that represents a material advance in the public policy related to air quality, the parameters established by WHO will be in force while the administrative omission in the issuance of the new Resolution persists.*

Direct enforcement action against individuals

In some cases, enforcement action against individuals may support fulfilment of AAQS obligations. A specific example is seen in United Republic of Tanzania's air quality regime, where financial sanctions may be imposed on any "person" who fails to carry out emergency prevention orders (discussed above), under regulation 26(5) of the Environmental Management (Air Quality Standards) Regulations 2007.

This kind of enforcement action is distinct from enforcement of regulatory regimes that impose pollution control obligations on individuals (such as enforcement by regulators of industrial permits). Sanctions for these kinds of regimes are routine and, while they can also support the attainment of AAQS, they are not concerned with the direct enforcement of AAQS or administrative mechanisms to institutionalize such standards. The latter require careful consideration of suitable enforcement mechanisms and sanctions.



Procedural rights for ambient air quality

7



Procedural rights for ambient air quality

Principle 10 of the 1992 Rio Declaration on Environment and Development provides that environmental issues are best handled with effective participation of all concerned citizens. That principle sets out three, interrelated pillars of environmental democracy and sound environmental governance: access to information, opportunity for public participation, and access to justice.

These fundamental obligations of contemporary environmental law are now enshrined in several regional treaties, such as the Aarhus Convention, and the Regional Agreement on Access to Information,

Public Participation and Justice in Environmental Matters in Latin America and the Caribbean (the Escazú Agreement). Both these treaties have detailed legal obligations in relation to the three pillars of principle 10 of the Rio Declaration. For parties to these treaties, these obligations should also translate through into national air quality legislation. For countries not covered by these treaties, they nonetheless provide useful normative guidance for the implementation of principle 10.

Note that public participation in the setting or revising of AAQS is considered above in **section 3**.



1992 Rio Declaration on Environment and Development

Principle 10

*Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate **access to information** concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and **encourage public awareness and participation** by making information widely available. **Effective access to judicial and administrative proceedings**, including redress and remedy, shall be provided.*

Public availability of AAQS legislation

Legislation promulgating AAQS and setting up administrative mechanisms to institutionalize these standards should be publicly available, published in any official gazette or journal, and accessible for free. This is consistent with the obligations to provide access to and disseminate “environmental information” under the Aarhus Convention.



Aarhus Convention 1998 Article 2: Definition

(3)(b)... [Environmental information means any information in any material form on measures including] legislation, plans and programmes, affecting or likely to affect the elements of the environment [including the air and atmosphere]...

In addition, arrangements should be made to ensure that vulnerable groups with specific barriers relating to access to information can access national legislative standards for air quality.

Public dissemination of air quality monitoring results

Air quality regimes should include an obligation to disseminate, passively and actively, monitoring results. Many countries in the world already provide online access to real-time air quality data, but not all. In Belgium, for example, air quality legislation and a cooperation agreement between regions guarantees a communication of air quality monitoring in real-time via a unique website: <https://www.irceline.be>. This implements requirements under European Union law.



European Union CAFE Directive 2008 Article 26

The [air quality] information shall be made available free of charge by means of any easily accessible media including the Internet or any other appropriate means of telecommunication.

In light of the highly technical nature of air quality information, communicating this information to the public in an accessible and understandable manner can be challenging. In this respect, official air quality indices (AQIs) have become particularly important, along with public websites. The elaboration of an index can ease communication and readability of data. There is no universal scale; a wide variety of AQIs which are used globally are not readily comparable. That said, some countries have borrowed from the United States Environmental Protection Agency Air Pollution Index in formulating their AQIs.

For an AQI to communicate reliable and scientifically robust knowledge to the public about air quality levels, much depends on the relationship between what it considers as “acceptable”, “good” and “low” levels of air pollution, the country’s AAQS, and potentially how its “breakpoints” relate to the WHO AQGs. This is not always clear, and the methodologies underlying national AQIs can differ and be difficult to understand. One example methodology is that adopted in the United Kingdom of Great Britain and Northern Ireland (using a 1–10 index), where green “low” levels (1–3) of air pollution tend to, although do not always, indicate levels of air pollution below national AAQS for key regulated air pollutants (based on short-term means). India uses a different numerical scale (1–500); again, the lower index bands (“good” and “satisfactory”) relate to India’s national “sacrosanct” AAQS, but these differ from those of the

United Kingdom of Great Britain and Northern Ireland. Other AQIs have methodologies that are less directly connected to AAQS, such as that of Malaysia, where the “dominant pollutant” (the pollutant with the highest index value) determines the overall index value. Other AQIs use different scientific units, such as that of the United States of America (locating levels of air pollution in parts per billion against a 1–500 scale to determine index categories).

Public participation in air quality management planning

Public participation in air quality management planning may be guaranteed in constitutional rights, general environmental legislation, or in specific legislation on ambient air quality. Thus, for example, article 92 of the

Constitution of Ethiopia provides that “[p]eople have the right to full consultation and to the expression of views in the planning and implementation of environmental policies and projects that affect them directly”.

Elements to consider in designing effective rights to participate in air quality planning include: bringing the public into initial planning processes; publicizing draft plans with enough time for the public to comment in order that their views be effectively taken into account in finalizing plans; publicizing underlying evidence for planning so this can also be scrutinized with sufficient time; and a requirement that views of the public are taken into account in finalizing plans.

An example of public participation mandated within a specific air quality regime is seen in Armenia’s Law on Atmospheric Air Protection.



Armenia
Law on Atmospheric Air Protection 1994 (official translation)
Article 9

[P]ublic organizations according to the legislation of the Republic of Armenia and their charters have the right to participate in realization of actions on protection of atmospheric air.

Citizens have the right to assist the state bodies in realization of actions on atmospheric air protection by direct participation in works on protection of atmospheric air, submission into the state bodies and public organizations of proposals on improvement of protection of atmospheric air, informing about infringements of the legislation on atmospheric air protection.

At realization of actions on atmospheric air protection the state bodies are obliged to take into account proposals of public organizations and citizens in the order established by the legislation of the Republic of Armenia.

European case law recognizes that individuals can request better plans from public authorities, if existing ones do not comply with legislative requirements for air quality planning (**section 6**), in order to protect public health. This was first established in Case C-237/07 *Janecek* (2008).



Case C-237/07 *Janecek* (2008)

38. [W]henever the failure to observe the measures required by the directives [i.e. EU legislation] which relate to air quality and drinking water, and which are designed to protect public health, could endanger human health, the persons concerned must be in a position to rely on the mandatory rules included in those directives.

39. The natural or legal persons directly concerned by a risk that the limit values or alert thresholds may be exceeded must be in a position to require the competent authorities to draw up an action plan where such a risk exists, if necessary by bringing an action before the competent courts.

Furthermore, in engaging the public in air quality management planning, governments should take specific measures to ensure the inclusion of women and girls as key stakeholders in an effort to “leave no one behind”.

Access to justice in relation to air quality legislation

Provisions on access to justice on environmental matters can be generic and/or inserted directly into air quality legislative frameworks. In light of the diffuse nature of air pollution and the widespread harms it causes, it is important to provide access not only to direct victims of air pollution but also to potential guardians of air quality, such as non-governmental organizations. The range of public interest litigation outlined in this Guide supporting the implementation of air quality regimes indicates the importance of this type of litigation in promoting robust air quality regimes and clean air for all.

Indonesia’s Environmental Management Law of 1997 concerning has introduced the right of communities to file class actions, in their own interests or the public interest, in relation to environmental problems harming the life and livelihood of the community (article 37). Procedural rules were specified in 2002 by the Regulation of the Supreme Court of the Republic of Indonesia Concerning Class Actions.



Coordinating air quality governance

8



Coordinating air quality governance

Since AAQS operate as an apex target for acceptable levels of air quality, achieving these legal targets require significant regulatory and policy coordination of control over polluting sources and behaviours that cumulatively lead to air pollution problems and breaches of AAQS. Legislative frameworks are important in requiring or guiding that coordination, in at least four dimensions:

- **coordinating regulatory control across borders (addressed in section 3 on transnational air pollution);**
- **coordinating different legal tools of air quality control;**
- **coordinating government policymaking; and**
- **coordinating legal AAQS with sectoral regulation of individual pollution sources.**

The latter three coordination issues are addressed in this section.

Coordinating legal tools of air quality control

Beyond AAQS, there are other legal approaches to regulating air quality. These should be coordinated with AAQS regimes to ensure mutually supporting implementation, and to maximize administrative efficiencies. One prominent example are legal commitments associated with the management of total emissions at a national scale (“national emissions ceilings”). Such emissions ceilings provide benefits both at the national scale, and in downwind countries, and for this reason are the cornerstone of transboundary

treaties on air pollution, as seen in the commitments under the CLRTAP and its Protocols. Although not directly linked to public health and exposure, these legal tools indirectly drive further improvements in air quality. Additionally, while the lowering of overall national emissions is virtually always beneficial for local and regional air quality, the prioritization of policies and interventions to meet such transboundary obligations may not necessarily align with actions that would deliver the greatest local population benefit. For example, an objective to reduce a country’s total national NO_x emissions might be achieved equally through actions to close coal-fired power stations or by reducing vehicle tailpipe emissions. The latter action would however likely have a greater beneficial impact on the public health within that country, since vehicle emissions occur at ground level and are concentrated in higher population density urban areas. Coordination across these different forms of air quality management is therefore essential. In particular, government officials involved in developing plans to meet national emissions ceilings should ensure that these are coordinated with ambient air quality plans in terms of policy priorities, so as to optimize compliance with national AAQS obligations as well.

For the protection of ecosystems, the deposition of pollution can be regulated through legal limits associated with critical loads (maximum amounts of a pollutant that may be deposited into an environment without causing significant harmful effects). Such limits are most widely used for nitrogen and sulfur deposition and ozone. Again, administrative processes associated with meeting these kinds of legal limits should be coordinated where possible with administrative and policy-planning processes associated with implementing AAQS.

Legal coordination of government policymaking and regulatory policy

Since air pollution is a collective action problem arising from decisions and behaviours across a wide range of policy sectors, policy and regulatory alignment across wide-ranging policy areas (environment, urban planning, transport, health, treasury, business, industrial strategy, education, etc.) is critical to achieving AAQS in practice. Poor policy and regulatory coordination put at risk the attainment of AAQS, whether due to siloed governmental policymaking, weak political will, or distinct mandates for separate regulators, even where overall legislative requirements to meet AAQS might exist. Thus, for example, certain regulators or policymakers may oversee control of highways or of local planning, and perceive that their remit is not related to air quality regulation. Nonetheless, decisions in these cognate areas of policy and regulation can support or undermine the attainment of AAQS.

Legislative provisions can require or construct coordination of government policymaking or regulatory authority. Given the challenges to making this happen in practice, the Guide strongly recommends that such provisions are considered and adopted as appropriate to the governmental structures within the relevant country. Such coordination measures may be horizontal (across the same level of government) or vertical (linking different levels of government control and action). In addition, ensuring that government coordination processes are gender-sensitive can support effective consideration and integration of women and girls in efforts to reduce and prevent pollution.

An example of how air quality legislation might require horizontal coordination of measures to address air quality exceedances is Israel's Clean Air Law 2008, which requires relevant authorities to work together when air pollution arises from causes outside a local authority's area of control.



Israel

Clean Air Law 5768-2008 (unofficial translation)

Section 12

(b) Where the Minister concludes that the air pollution in the air pollution-impacted area stems, inter alia, from air pollution caused within the bounds of a local authority outside the impacted area, then they shall state that in the order said in section 11(a), and shall so inform that local authority and the provisions of subsection (a) shall apply to it, mutatis mutandis.

(c) Where the Minister concludes that undertaking measures as said in subsection (a) in an air pollution-impacted area requires cooperation between local authorities within a metropolitan area, then they shall state that in the order said in section 11(a) and shall so inform the local authorities in the metropolitan area; the local authorities in the metropolitan area shall prepare a joint programme of activity.

A more recent example is seen in the United Kingdom of Great Britain and Northern Ireland, in the Environment Act 1995 (as amended by the Environment Act 2021, schedule 11), which draws in a range of potential public actors as "air quality partners" to support the attainment of AAQS. This potentially requires regulators charged

with regulating specific sources of pollution (industry, transport, highways, etc.), or with regulating pollution in other locations, to assist local authorities in remedying AAQS breaches. This constructs a form of legally mandated horizontal regulatory coordination.



United Kingdom of Great Britain and Northern Ireland
Environment Act 1995 (as amended)

[‘Air quality partners’ are defined in section 85A as those identified by section 82(5)(b) and (c):]

Section 82: Local authority reviews

(4) [A local authority] must identify any parts of its area in which it appears that air quality standards or objectives are not likely to be achieved within the relevant period.

(5) [A local authority] must also –

(a) identify relevant sources of emissions that it considers are, or will be, responsible (in whole or in part) for any failure to achieve air quality standards or objectives in its area,

(b) in the case of a relevant source within the area of a neighbouring authority, identify that authority, and

(c) in the case of a relevant source within an area in relation to which a relevant public authority or the Agency has functions of a public nature, identify that person in relation to that source.

[Obligations on air quality partners are set out in section 85B:]

Section 85B: Role of air quality partners in relation to action plans

(1) Where a local authority in England intends to prepare an action plan [for securing that air quality standards and objectives are achieved in an air quality management area] it must notify each of its air quality partners that it intends to do so.

(2) Where an air quality partner of a local authority has been given a notification under subsection (1) it must, before the end of the relevant period, provide the authority with proposals for particular measures the partner will take to contribute to the achievement, and maintenance, of air quality standards and objectives in the area to which the plan relates.

...

(5) The Secretary of State may direct an air quality partner to make further proposals under subsection (2) ... where the Secretary of State considers the proposals made by the partner under that subsection are insufficient or otherwise inappropriate.

Beyond horizontal coordination, vertical coordination is still required, particularly in multilevel systems of government. Appropriate levels of government must take responsibility for controlling air quality to ensure effective outcomes. Legal regimes may allocate air quality management responsibilities, as between different levels of government and clear allocation of responsibility is necessary to ensure accountability for AAQS and efficient governance. It is important to ensure that the level of government with the *power* to direct and coordinate policy areas implicated by AAQS is given the *corresponding legal responsibility*. Tension can arise, in

particular, in making local authorities legally responsible for addressing air pollution problems when ultimate control over some sources lies at a different (usually higher, central) level of government (Scotford 2019).

An example of a wide-ranging obligation to coordinate efforts to achieve the goals of an air quality regime is seen in the Philippine Clean Air Act of 1999.

A more direct duty on emanations of the state to comply with national air quality law is seen in South Africa's Air Quality Act 2004.



Philippines
Clean Air Act of 1999
Section 35. Linkage Mechanism

The Department shall consult, participate, cooperate and enter into agreement with other government agencies, or with affected nongovernmental organizations (NGOs) or people's organizations (POs), or private enterprises in the furtherance of the objectives of this Act.



South Africa
National Environmental Management: Air Quality Act 2004
Article 7. Establishment

(3) *The national framework [on air quality] –*

(a) binds all organs of state in all spheres of government; and

(b) may assign and delineate responsibilities for the implementation of this Act amongst –

(i) the different spheres of government; and

(ii) different organs of state.

(4) An organ of state must give effect to the national framework when exercising a power or performing a duty in terms of this Act or any other legislation regulating air quality management.

Finally, in coordinating government policymaking, it is important to ensure not only that all relevant government actors are brought into plans for achieving AAQS, but also that other policies developed by government (i.e. not relating specifically to air quality policy) do not undermine attainment of AAQS. Policy clashes can occur even between different environmental policies, as seen in many countries with the promotion of diesel cars to further decarbonization policies, with a deleterious impact on local ambient air quality. In particular, climate change and air quality policies should be coordinated and mutually reinforcing (Fowler *et al.* 2021). Similarly, it is important that public health and air quality policies are closely aligned (Royal College of Physicians 2016). Legislative obligations on government as a whole to achieve AAQS (**section 6**) can inform such holistic policymaking.

Legal coordination of interconnected sectoral regulation: Aligning individual decision-making with AAQS

Decision-making for individual projects under different areas of sectoral regulation can impact achievement of AAQS. Accordingly, sectoral regulatory schemes should

take into account or otherwise be aligned with AAQS in authorizing individual projects. This is most pertinent in relation to urban planning decisions and industrial permitting.

Urban planning decisions and AAQS

Informing decision-making in individual urban planning decisions often requires appropriate framing of policy or plans that inform that decision-making. Thus, for example, in the National Planning Policy Framework 2021 of the United Kingdom of Great Britain and Northern Ireland (which is a mandatory relevant consideration in the English legislative planning scheme), strategic planning policy supports the attainment of air quality standards.

Legislative provisions prioritizing AAQS in relation to individual planning decisions are also important. Thus individual decision-making might be required to take into account applicable AAQS as a relevant or material consideration in authorizing new development. Any such requirement should take into account the cumulative impact of individual decisions in relation to air quality. Air quality impacts in planning decisions are often assessed and taken into account through environmental impact assessment procedures, but they can risk being watered down as one of many environmental impacts considered in the balance of planning decision-making.



United Kingdom of Great Britain and Northern Ireland (England) National Planning Policy Framework 2021

[186] Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications...



It is good practice to require the preparation of specific “air quality assessments” in relation to proposed development, setting out the significance of effects from the proposed development, the basis of this assessment, cumulative impacts, and so on (Environmental Protection UK and Institute of Air Quality Management 2017).

Explicit constraints that prioritize compliance with AAQS in deciding individual planning proposals are less common but could be considered in areas with severe air pollution problems.

However constructed, some kind of alignment of individual decision-making will be required to coordinate between AAQS and planning decisions in practice, in light of the risk of “salami slicing” permission to pollute in acceptable amounts for individual developments, thereby missing the cumulative polluting impact of multiple approved developments.

Industrial permitting and AAQS

Similar considerations obtain in relation to permitting of industrial installations. In relation to authorizing the (polluting) operation of individual installations within the constraints of AAQS, there are many examples of this in different countries. Thus, for example, Jamaica’s Natural Resources Conservation Authority (Air Quality) Regulations 2006 provides that individual installations, with identified pollution risks, should be granted licences to operate with conditions relating to ambient air quality.



Jamaica

Natural Resources Conservation Authority (Air Quality) Regulations 2006

Article 18

An operator of a facility with any source referred to in the Fourth Schedule may be required, as a condition of an air pollutant discharge licence, to measure the emission of every priority air pollutant emitted therefrom and to develop and implement a plan to control such emissions in accordance with ambient air quality emission guidelines established by the Authority.

Complications can arise where AAQS apply in areas where air pollution is permitted by a discharge consent that might cause AAQS to be breached in the vicinity of the relevant regulated operation. Disapplying standards in that case unhelpfully constructs a legal conflict between AAQS and permitting of individual installations, and risks side-lining public health concerns. Instead, AAQS should be the starting point in thinking about industrial permitting, so that permitting for individual installations can take into account AAQS responsively, consistently with a legal framework that prioritizes public health and environmental protection outcomes. In the European Union, for example, Directive 2010/75/EU of the European Parliament and the Council on industrial emissions, applicable to all 27 European Union Member States and under revision at the time of publishing this Guide, recognizes the adaptive impact of environmental quality standards.



Ultra Low Emission Zone, Hyde Park, London, United Kingdom of Great Britain and Northern Ireland. © Unsplash/Bruno Martins.



European Union

Industrial Emissions Directive 2010

Article 18

Where an environmental quality standard [defined as “the set of requirements which must be fulfilled at a given time by a given environment or particular part thereof, as set out in Union law”, including EU AAQS] requires stricter conditions than those achievable by the use of the best available techniques, additional measures shall be included in the permit, without prejudice to other measures which may be taken to comply with environmental quality standards.

...

Article 21

5. The permit conditions shall be reconsidered and, where necessary, updated ... where it is necessary to comply with a new or revised environmental quality standard in accordance with Article 18.

Another stringent example is seen in Benin’s Governmental Decree on Ambient Air Quality Standards.



Benin

Governmental Decree on Ambient Air Quality Standards of 2001 (unofficial translation)

Article 4

*The construction or modification of a stationary source or the increase in the production of a good or service whose emissions of particles or dust, CO, SO₂, NO₂ and lead are **likely to increase** the concentration of these pollutants in the atmosphere beyond the standards referred to in article 3 of the present decree, is forbidden.*



References

International policy, guidance and evidence

United Nations Economic Commission for Europe

Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (the Aarhus Convention) (1998), entered into force 30 October 2001.

United Nations Economic Commission for Europe. Air pollution, ecosystems and biodiversity. <https://unece.org/air-pollution-ecosystems-and-biodiversity>. Accessed 26 January 2023.

United Nations Environment Programme

United Nations Environment Programme (2014). Strengthening the role of the United Nations Environment Programme on promoting air quality. Resolution 1/7. In *Proceedings of the United Nations Environment Assembly of the United Nations Environment Programme at its First Session*. 23–27 June. UNEP/EA.1/10. <https://wedocs.unep.org/bitstream/handle/20.500.11822/17289/K1402481.pdf>.

United Nations Environment Programme (2016a). *Actions on Air Quality: Policies & Programmes for Improving Air Quality Around the World*. Nairobi: UNEP. <https://www.unep.org/resources/assessment/actions-air-quality>.

United Nations Environment Programme (2016b). *Resolution 1/7: Strengthening the Role of the United Nations Environment Programme in Promoting Air Quality – Report of the Executive Director*. Nairobi, 23–27 May. UNEP/EA.2/6. <https://wedocs.unep.org/handle/20.500.11822/34316>.

United Nations Environment Programme (2017). *Resolution 3/4. Environment and health*. UNEA Resolution UNEP/EA.3/Res.4. Nairobi, 4–6 December. <https://wedocs.unep.org/handle/20.500.11822/30795>.

United Nations Environment Programme (2021a). *Regulating Air Quality: The First Global Assessment of Air Pollution Legislation*. Nairobi: UNEP. <https://www.unep.org/resources/report/regulating-air-quality-first-global-assessment-air-pollution-legislation>.

United Nations Environment Programme (2021b). *Actions on Air Quality: A Global Summary of Policies and Programmes to Reduce Air Pollution*. Nairobi: UNEP. <https://www.unep.org/resources/report/actions-air-quality-global-summary-policies-and-programmes-reduce-air-pollution>.

United Nations Environment Programme (2022a). *For People and Planet: The United Nations Environment Programme Strategy for Tackling Climate Change, Biodiversity and Nature Loss, and Pollution and Waste from 2022–2025 (Medium-term Strategy)*. Nairobi: UNEP. <https://wedocs.unep.org/bitstream/handle/20.500.11822/35875/K2100501-e.pdf>.

United Nations Environment Programme (2022b). Status of implementation, activities and funding: Report by the secretariat. In *Implementation of the Fifth Programme for the Development and Periodic Review of Environmental Law (Montevideo V): Delivering for People and the Planet. First Global Meeting of National Focal Points*. Nairobi, 6–9 June. UNEP/Env.Law/MTV5/GNFP.1/2/Rev.1. <https://leap.unep.org/sites/default/files/inline-files/Status%20of%20implementation%2C%20activities%20and%20funding%20-%20English.pdf>.

United Nations Environment Programme (2022c). Frequently asked questions on air pollution. 7 September. <https://www.cleanairblueskies.org/did-you-know/frequently-asked-questions-air-pollution>. Accessed 30 January 2023.

United Nations General Assembly

United Nations General Assembly (2015). *Resolution Adopted by the General Assembly on 25 September 2015: The 2030 Agenda for Sustainable Development*. Seventieth session. 25 September. A/RES/70/1. https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_70_1_E.pdf.

United Nations General Assembly (2019a). *Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment: Report of the Special Rapporteur*. Human Rights Council, fortieth session. 25 February–22 March. A/HRC/40/55. <https://documents-dds-ny.un.org/doc/UNDOC/GEN/G19/002/54/PDF/G1900254.pdf>.

United Nations General Assembly (2019b). *Report of the United Nations Conference on Environment and Development*. Rio de Janeiro. 3–14 June 1992. A/CONF.151/26 (Vol. I).

United Nations General Assembly (2022a). *Resolution Adopted by the General Assembly on 28 July 2022: The Human Right to a Clean, Healthy and Sustainable Environment*. Seventy-sixth session. 28 July. A/RES/76/300. <https://documents-dds-ny.un.org/doc/UNDOC/GEN/N22/442/77/PDF/N2244277.pdf>.

United Nations General Assembly (2022b). *The Right to a Clean, Healthy and Sustainable Environment: Non-toxic Environment. Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment*. Human Rights Council, forty-ninth session. 23 February–1 April. A/HRC/49/53. <https://documents-dds-ny.un.org/doc/UNDOC/GEN/G22/004/48/PDF/G2200448.pdf>.

World Health Organization

World Health Organization (2015). *Health and the environment: Addressing the health impact of air pollution*. Resolution 68.8. In *Sixty-eighth World Health Assembly: Resolutions and Decisions*. 18–26 May. WHA68/2015/REC/1. https://apps.who.int/gb/ebwha/pdf_files/WHA68-REC1/A68_R1_REC1-en.pdf.

World Health Organization (2016). *Burning Opportunity: Clean Household Energy for Health, Sustainable Development, and Wellbeing of Women and Children*. Geneva: WHO. https://apps.who.int/iris/bitstream/handle/10665/204717/9789241565233_eng.pdf.

World Health Organization (2021). *WHO Global Air Quality Guidelines: Particulate Matter (PM_{2.5} and PM₁₀), Ozone, Nitrogen Dioxide, Sulfur Dioxide and Carbon Monoxide*. Geneva: WHO. <https://apps.who.int/iris/bitstream/handle/10665/345329/9789240034228-eng.pdf>.

World Health Organization Executive Board (2015). *Health and the Environment: Draft Roadmap for an Enhanced Global Response to the Adverse Health Effects of Air Pollution*. Report by the Secretariat. 138th session. 27 November. EB138/17. https://apps.who.int/iris/bitstream/handle/10665/250653/B138_17-en.pdf.

World Health Organization Regional Office for Europe (2006). *Air Quality Guidelines: Global Update 2005 – Particulate Matter, Ozone, Nitrogen Dioxide and Sulfur Dioxide*. Copenhagen: WHO Regional Office for Europe. <https://apps.who.int/iris/bitstream/handle/10665/107823/9789289021920-eng.pdf>.

World Health Organization Regional Office for Europe (2013). *Review of Evidence on Health Aspects of Air Pollution: REVIHAAP Project. Technical Report*. Copenhagen: WHO Regional Office for Europe. https://www.euro.who.int/_data/assets/pdf_file/0004/193108/REVIHAAP-Final-technical-report-final-version.pdf.

World Meteorological Organization

Peltier, R.E. (ed.) (2022). *An Update on Low-cost Sensors for the Measurement of Atmospheric Composition*. Geneva: WMO. https://library.wmo.int/doc_num.php?explnum_id=10620.

World Meteorological Organization (2021). *WMO Air Quality and Climate Bulletin released for Clean Air Day*. 7 September. <https://public.wmo.int/en/media/press-release/wmo-air-quality-and-climate-bulletin-released-clean-air-day>. Accessed 26 January 2023.

National/regional guidance

Environmental Protection UK and Institute of Air Quality Management (2017). *Land Use Planning & Development Control: Planning for Air Quality*. London: Institute of Air Quality Management. https://www.environmental-protection.org.uk/wp-content/uploads/2013/07/air-quality-planning-guidance_Jan17.pdf.

European Commission (2018). *A Clean Planet For All: A European Strategic Long-term Vision for a Prosperous, Modern, Competitive and Climate Neutral Economy*. Brussels. COM(2018) 773 final. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018DC0773>.

European Commission (2019). *Commission Staff Working Document: Fitness Check of the Ambient Air Quality Directives*. Brussels. SWD(2019) 427 final. <https://data.consilium.europa.eu/doc/document/ST-14712-2019-INIT/en/pdf>.

Watson, J.G., Chow, J.C., DuBois, D., Green, M., Frank, N. and Pitchford, M. (1997). *Guidance for Network Design and Optimum Site Exposure for PM_{2.5} and PM₁₀*. Research Triangle Park: United States Environmental Protection Agency. <https://www3.epa.gov/ttnamti1/files/ambient/pm25/network/r-99-022.pdf>.

Case law (referenced in Guide)

Amis de la Terre. 2021. French Council of State Decision no. 428409. ECLI:FR:CECHR:2021:428409.20210804 (France).

Case C-237/07 *Janecek*. 2008. EU:C:2008:447 (European Union).

Case C-404/13 R (*ClientEarth*) v *Secretary of State for the Environment, Food and Rural Affairs*. 2013. ECLI:EU:C:2013:805 (European Union).

Case C 488/15 *Commission v Bulgaria*. 2017. EU:C:2017:267 (European Union).

Case C 638/18 *Commission v Romania (Exceedance of limit values for PM₁₀)*. 2020. EU:C:2020:334 (European Union).

Case C-644/18 *Commission v Italy*. 2020. ECLI:EU:C:2020:895 (European Union).

Case C-723/17 *Lies Craeynest and Others v Brussels Hoofdstedelijk Gewest and Brussels Instituut voor Milieubeheer*. 2019. ECLI:EU:C:2019:533 (European Union).

Case C-752/18 *Deutsche Umwelthilfe*. 2019. ECLI:EU:C:2019:1114 (European Union).

Procurador-Geral Da República and Others v Presidente do Conselho Nacional do Meio Ambiente. 2022, 5 May. Brazilian Supreme Court ADI no. 6148, ATA no. 12, DJE no. 93 (Brazil).

R (ClientEarth [No. 2]) v Secretary of State for the Environment, Food and Rural Affairs. 2016. EWHC 2740 (United Kingdom of Great Britain and Northern Ireland).

R (ClientEarth [No. 3]) v Secretary of State for the Environment, Food and Rural Affairs, Secretary of State for Transport, and Welsh Ministers. 2018. EWHC 315 (United Kingdom of Great Britain and Northern Ireland).

Trail Smelter Arbitration (United States of America v Canada). 1941. 3 UNRIAA 1905.

Trustees for the time being of Groundwork Trust and Another v Minister of Environmental Affairs and Others. 2022. South African High Court Case no. 39724/2019 (South Africa).

Whitman v American Trucking Associations, Inc. 2001. 531 US 457 (United States of America).

Legislative instruments (referenced in Guide)

Argentina, Autonomous City of Buenos Aires Law on the Preservation of Air Resources and the Prevention and Control of Atmospheric Pollution, No. 1356 (2004).

Armenia, Law No. N C-1109-1-3P-121 on atmospheric air protection of 01 November 1994.

Australia, National Environment Protection (Ambient Air Quality) Measure (2016).

Benin, Decree No. 2001-110 on Ambient Air Quality Standards of 2001.

Bolivia, Regulations on Air Pollution (1995).

Eswatini, Air Pollution Control Regulations 2010.

European Union, Directive 2008/50/EC of European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe.

European Union, Directive 2010/75/EU of the European Parliament and of the Council 24 November 2010 on industrial emissions (integrated pollution prevention and control).

India, Air (Prevention and Control of Pollution) Act, 1981.

Israel, Clean Air Law 2008.

Jamaica, Natural Resources Conservation Authority (Air Quality) Regulations, 2006.

Jordan, Environmental Protection Law No. 6 of 2017.

Mexico, Official Mexican Standard NOM-022-SSA1-2019, Environmental health. Criterion to evaluate the quality of the ambient air, with respect to sulfur dioxide (SO₂). Standardized values for the concentration of sulfur dioxide (SO₂) in the ambient air, as a measure to protect the health of the population (2019).

New Zealand, Resource Management (National Environmental Standards for Air Quality) Regulations 2004.

Philippines, Philippine Clean Air Act of 1999, Republic Act No. 8749.

Republic of Korea, Clean Air Conservation Act (2007).

Sierra Leone, Environment Protection Agency Act, 2008, No. 11 of 2008.

South Africa, Air Quality Act 29 of 2004.

Switzerland, Ordinance on Air Pollution Control of 16 December 1985.

Türkiye, Regulation on Air Quality Assessment and Management, Official Journal, No. 27219 (2009).

United Kingdom of Great Britain and Northern Ireland, National Planning Policy Framework (2021).

United Kingdom of Great Britain and Northern Ireland, Environmental Act 2021.

United Republic of Tanzania, Environmental Management Act 2004, Act No. 20/04

United Republic of Tanzania, Environmental Management (Air Quality Standards) Regulations, 2007.

United States of America, Clean Air Act (1963).

Literature

Evangelopoulos, D., Pérez-Velasco, R., Walton, H., Gumy, S., Williams, M., Kelly, F.J. *et al.* (2020). The role of burden of disease assessment in tracking progress towards achieving WHO global air quality guidelines. *International Journal of Public Health* 65, 1455-1465. <https://doi.org/10.1007/s00038-020-01479-z>.

Fowler, D., Wild, O., Lewis, A., Carslaw, D., Bloss, W., Beevers, S. *et al.* (2021). *Effects of Net-zero Policies and Climate Change on Air Quality*. London: The Royal Society. <https://royalsociety.org/-/media/policy/projects/air-quality/air-quality-and-climate-change-report.pdf>.

Hodges, J.T., Viallon, J., Brewer, P.J., Drouin, B.J., Gorshchev, V., Janssen, C. *et al.* (2019). Recommendation of a consensus value of the ozone absorption cross-section at 253.65 nm based on a literature review. *Metrologia* 56(3), 034001. <https://doi.org/10.1088/1681-7575/ab0bdd>.

Hoffmann, B., Boogaard, H., de Nazelle, A., Andersen, Z.J., Abramson, M., Brauer, M. *et al.* (2021). WHO Air Quality Guidelines 2021 – Aiming for healthier air for all: A joint statement by medical, public health, scientific societies and patient representative organisations. *International Journal of Public Health*. <https://doi.org/10.3389/ijph.2021.1604465>.

- Huang, W. (2022). The update of World Health Organization Air Quality Guidelines and its implications on health risk management in low- and middle-income countries. *Global Health Journal* 6(1), 1–58. <https://doi.org/10.1016/j.glohj.2022.01.004>.
- Kutlar Joss, M., Eeftens, M., Gintowt, E., Kappeler, R. and Künzli, N. (2017). Time to harmonize national ambient air quality standards. *International Journal of Public Health* 62, 454–462. <https://doi.org/10.1007/s00038-017-0952-y>.
- Livermore, M.A. and Revesz, R.L. (2014). Rethinking health-based environmental standards. *New York University Law Review* 89(4), 1184–1267. <https://www.nyulawreview.org/wp-content/uploads/2018/08/NYULawReview-89-4-1184-Livermore-Revesz.pdf>.
- Lode, B., Schönberger, P. and Toussaint P. (2016). Clean air for all by 2030? Air quality in the 2030 Agenda and in international law. *Review of Comparative & International Environmental Law* 25(1), 27–38. <https://doi.org/10.1111/reel.12151>.
- Misonne, D. (2020). Arm wrestling around air quality and effective judicial protection: Can arrogant resistance to EU law-related orders put you in jail? *Journal for European Environmental & Planning Law* 17(4), 409–425. <https://doi.org/10.1163/18760104-01704004>.
- Misonne, D. (2021). The emergence of a right to clean air transforming European Union law through litigation and citizen science. *Review of Comparative & International Environmental Law* 30(1), 34–45. <https://doi.org/10.1111/reel.12336>.
- Norris, S.L. and Ford, N. (2017). Improving the quality of WHO guidelines over the last decade – progress and challenges. *Lancet*, e855. <https://doi.org/10.1007/s00038-020-01479-z>.
- Royal College of Physicians (2016). *Every Breath We Take: The Lifelong Impact of Air Pollution*. London: Royal College of Physicians. <https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution>.
- Scotford, E. (2019). Air quality law for the future: Fixing the fundamentals, 14 February. <https://www.brexitenvironment.co.uk/2019/02/14/air-quality-law-for-the-future/>.
- Scotford, E. (2020). Rethinking clean air: Air quality law and Covid. *Journal of Environmental Law* 32(3), 349–353. <https://doi.org/10.1093/jel/eqaa027>.
- Taddei, U. (2016). A right to clean air in EU law? Using litigation to progress from procedural to substantive environmental rights. *Environmental Law Review* 18(1), 3–7. <https://doi.org/10.1177/1461452916634519>.
- Taddei, U. (2020). Case C-723/17 Craeynest: New developments for the right to clean air in the EU. *Journal of Environmental Law* 32(1), 151–160. <https://doi.org/10.1093/jel/eqaa001>.
- Vahlsing, C. and Smith, K.R. (2012). Global review of national ambient air quality standards for PM₁₀ and SO₂ (24 h). *Air Quality, Atmosphere & Health* 5(4), 393–399. <https://doi.org/10.1007/s11869-010-0131-2>.
- Yamineva, Y. and Romppanen, S. (2017). Is law failing to address air pollution? Reflections on international and EU developments. *Review of Comparative & International Environmental Law* 26(3), 189–200. <https://doi.org/10.1111/reel.12223>.
- Whaley, P., Nieuwenhuijsen, M. and Burns, J. (eds.) (2022). *Update of the WHO Global Air Quality Guidelines: Systematic Reviews*. *Environment International* 142 (special issue). <https://www.sciencedirect.com/journal/environment-international/special-issue/10MTC4W8FXJ1>.

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