

MEGACITIES PARTNERSHIP

Integrated Air Quality and Climate Management Plan (AQCMP) Template[[1]](#footnote-2)

March 2023

Table of Contents

[Executive Summary 1](#_Toc124432007)

[1. Introduction 3](#_Toc124432008)

[2. Air Quality and Climate Management Plan (AQCMP) Development Process 6](#_Toc124432009)

[2.1. Stakeholder Engagement in the AQCMP Development Process 6](#_Toc124432010)

[2.2. Current Air Quality Monitoring Network, Emissions Inventory, and other Data Sources 7](#_Toc124432011)

[2.3. AQCMP Development: Analytic Steps 7](#_Toc124432012)

[3. Summary of the Air Quality and Emissions Baseline Characterization 8](#_Toc124432013)

[3.1. Baseline Emissions and Atmospheric Conditions 8](#_Toc124432014)

[3.2. Expected Emissions Trends 8](#_Toc124432015)

[3.3. Ambient Air Quality 9](#_Toc124432016)

[3.4. Health Implications of the Baseline Air Quality Scenario 9](#_Toc124432017)

[3.5. Climate Implications of the Baseline Emissions Scenario 11](#_Toc124432018)

[3.6. Capacity Assessment 12](#_Toc124432019)

[4. Gaps and Limitations 13](#_Toc124432020)

[4.1. Enhance AQ monitoring capabilities 13](#_Toc124432021)

[4.2. Improve air pollution and GHG emissions inventories 13](#_Toc124432022)

[4.3. Improve access to laboratory facilities for air pollutant source tracing and source apportionment 13](#_Toc124432023)

[4.4. Improve national-city cooperation 13](#_Toc124432024)

[4.5. Enhance education and outreach on air pollution issues 14](#_Toc124432025)

[4.6. Develop inclusive public participation 14](#_Toc124432026)

[5. Overall Objective and Goals of the AQCMP 14](#_Toc124432027)

[6. Implementation Plan 19](#_Toc124432028)

[7. Monitoring and Evaluation 26](#_Toc124432029)

[8. Conclusion 27](#_Toc124432030)

[9. Tools and Resources 28](#_Toc124432031)

Executive Summary

*Include an executive summary of main findings here. Review government motivations for action, health and economic costs of inaction, and key features of the plan. Consider adding information about how the plan will be financed, and whether gaps in funding might be filled through donor engagement. Exhibits 1 and 2 include quotes from Metro Vancouver and Côte d’Ivoire, which cover motivations for developing an integrated air quality and climate management plan, and potential broader national frameworks.*

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| **Exhibit 1: Metro Vancouver’s Motivation for an Integrated Air Quality and Greenhouse Gas Management Plan** |
| “Healthy, clean, and clear air is a foundation of the high quality of life, the robust and creative economy, and the spectacular natural beauty we enjoy in Metro Vancouver. Maintaining high standards for air quality in our region, for both current and future generations, is a key part of Metro Vancouver’s long-term vision. Clean air is essential to the health of all residents of the region, as well as to our local ecosystems which provide food, jobs, and recreational opportunities for all of us. Clear air provides us with unfettered views of the region’s natural beauty and some of our most iconic places. Metro Vancouver is committed to monitoring and continuously improving the air quality of the region. As a region we are also committed to reducing our greenhouse gas emissions to fulfill our obligation of minimizing our impact on the global climate.  This Integrated Air Quality and Greenhouse Gas Management Plan recognizes the inextricable link between air quality, climate change and energy issues, and accordingly, integrates goals, strategies and actions related to both air contaminants and greenhouse gases.  The long-term vision for air quality and greenhouse gas management in Metro Vancouver is:  Healthy, clean, and clear air for current and future generations.”  *Source:* [*Metro Vancouver Integrated Air Quality and Greenhouse Gas Management Plan*](http://www.metrovancouver.org/services/air-quality/AirQualityPublications/IntegratedAirQualityGreenhouseGasManagementPlan-October2011.pdf) |

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| **Exhibit 2: Côte d’Ivoire’s Nationally Determined Contributions Plan** |
| “Taking into account cross-cutting aspects such as gender, the territorialization of climate action, green jobs, health and air pollution in the implementation of Nationally Determined Contributions (NDCs) would generate significant co-benefits. Thus, taking gender into account can significantly improve climate governance, particularly in rural areas. As for the territorialization of the NDCs, it will make it possible to integrate climate concerns into local development plans, policies, and strategies. With regard to green jobs, they constitute a double boon through participation in the reduction of unemployment on the one hand, and the development of an economic model that is more respectful of the environment and human beings on the other. Finally, the reduction of short-lived climate pollutants (SLCPs) would also make a significant contribution to the commitment to GHG mitigation, to avoid more than 7,000 premature deaths due to exposure to fine particles by 2030, thus contributing to the improvement of air quality, the health of populations and to sustainable development.”  *Source:* [*Contributions Déterminées au niveau National (CDN) Côte d’Ivoire*](https://unfccc.int/sites/default/files/NDC/2022-06/CDN_CIV_2022.pdf) *(Côte d’Ivoire’s Nationally Determined Contribution Plan), translated via* [*Google Translate*](https://translate.google.com/) |

# Introduction

*This section provides a brief history of air quality management, climate change mitigation, relevant authorities, and the impetus for development of this plan. Regarding climate change mitigation, this can include the national context of the city’s climate goals such as Nationally Determined Contributions (NDCs) and national climate plans.*

*This section may also include an explanation of the importance of an integrated climate and air quality plan, highlighting key pollutants and their impacts on health and the environment. Exhibit 3 explains the importance of Short-Lived Climate Pollutants (SLCPs) in tackling climate change and air pollution. Exhibit 4 describes targeted actions for air pollutant and GHG emissions.*

*Finally, this section can include a statement of national or city-scale commitments to greenhouse gas (GHG) reductions (often through NDCs) and the overall vision for air quality management goals. Cross-cutting objectives, such as gender or vulnerable population focused policies, can also be mentioned.*

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| **Exhibit 3: Short-Lived Climate Pollutants (SLCPs)** |
| SLCPs, which sit at the intersection of air and climate pollution, exist in the atmosphere for a shorter period and therefore have a larger effect on near-term climate impacts. SLCPs include tropospheric ozone, black carbon, methane, and hydrofluorocarbons (HFCs). Exhibit 3a compares the near-term temperature impact over time of various SLCPs compared to other common pollutants, and Exhibit 3b demonstrates the overlaps between air pollutants, greenhouse gases, and SLCPs.  Diagram  Description automatically generated  *Exhibit 3a, source:* [*Air Pollution in Asia and the Pacific: Science-based Solutions, CCAC*](https://www.ccacoalition.org/en/resources/air-pollution-asia-and-pacific-science-based-solutions-summary-full-report)  Diagram  Description automatically generated  *Exhibit 3b, adapted from:* [*Opportunities for Increasing Ambition of Nationally Determined Contributions Through Integrated Air Pollution and Climate Change Planning: A Practical Guidance Document, CCAC*](https://www.ccacoalition.org/en/resources/opportunities-increasing-ambition-nationally-determined-contributions-through-integrated)  Air pollution and climate change require integrated planning efforts to increase benefits between the two closely linked issues, which makes reducing SLCPs a key goal. Reducing SLCPs effectively delays short-term warming impacts, and therefore should be a key component in addressing negative climate and air quality effects. Specific policies can target SLCPs, including switching to cleaner cookstoves, reducing waste incineration, and reducing the use of coal to improve health outcomes and provide near-term climate benefits. |

| **Exhibit 4: Considering Targeted Actions for Air Pollution and GHG Emissions** | |
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| Climate change is a global issue requiring international cooperation. However, the costs associated with greenhouse gas reductions (called “climate change mitigation”) can make it difficult for local municipalities to act solely based on the local benefits of climate action. Integrating air pollution planning with climate change planning can result in greater emissions reductions of both conventional air pollutants and greenhouse gas emissions, since there are substantial local health benefits to improved air quality. The following examples explore these connections in more depth. | |
| Coal power plants | Coal combustion, used to generate electricity in power plants, results in the emission of many harmful pollutants, including sulfur dioxide, nitrogen oxides, particulates, carbon dioxide, mercury, and other heavy metals. Targeting actions in an air pollution and climate plan to transition away from coal power plants to renewable sources of energy, or to use equipment to reduce emissions on existing plants, can help to reduce warming and improve air quality for public health at the same time.  *Source:* [*U.S. Energy Information Administration*](https://www.eia.gov/energyexplained/coal/coal-and-the-environment.php) |
| Mobile vehicle emissions | In addition to carbon dioxide, cars generate harmful byproducts while burning gasoline and diesel fuel. These include nitrogen dioxide, carbon monoxide, hydrocarbons, benzene, and formaldehyde. Older models of cars often emit even more harmful pollutants, and at higher rates. By encouraging the transition to cleaner vehicles (such as electric vehicles, hybrid vehicles, or gasoline cars with more stringent emissions standards), the environment and people’s health will be better off. Reducing mobile vehicle emissions should also include a transition away from motor vehicles usage towards other modes of transportation such as bicycling, walking, or public transportation.  *Source:* [*Department of Ecology, WA*](https://ecology.wa.gov/Issues-and-local-projects/Education-training/What-you-can-do/Reducing-car-pollution#:~:text=Burning%20gasoline%20and%20diesel%20fuel,reduce%20pollution%20from%20motor%20vehicles.) |
| Cookstoves | Emissions from rudimentary stoves or open fires, which depend on the burning of biomass such as wood, charcoal, crop residues and dung, as well as coal, constitute a major contribution to indoor and ambient air pollution. Exposure to household smoke is a major health concern, contributing to a wide range of illnesses such as pneumonia, low-birth weight, lung cancer, chronic obstructive pulmonary disease, and heart disease. The use of such cookstoves results in the emissions of carbon dioxide, methane, and black carbon (all of which have negative climate impacts), as well as other harmful air pollutants. Investing in cleaner cooking appliances such as highly efficient stoves can reduce fuel use, therefore reducing GHG and black carbon emissions.  *Sources:* [*Garland et al. 2017*](https://cleancooking.org/wp-content/uploads/2021/07/522-1.pdf')*,* [*U.S. EPA*](https://www.epa.gov/air-research/household-energy-and-clean-cookstove-research)*,* [*Clean Cooking Alliance*](https://cleancooking.org/wp-content/uploads/2021/11/CCA-Climate-Environment-and-Clean-Cooking-Factsheet_10.29.21.pdf) |
| Open burning | Open burning is a common method to dispose of materials such as municipal waste, auto body components, agricultural waste, and other biomass. Many farmers clear weeds and waste with fire in their fields before planting a new crop. This results in emissions of particulate matter (such as black carbon), carbon monoxide, and hydrocarbons, as well as sulfur oxides and carbon dioxide. Open burning is responsible for more than a third of all black carbon emissions, which worsens climate change and contributes to air pollution. Supporting no-burn alternatives prioritizes the health of the community and reduces greenhouse gases, while also preserving the fertility of the soil.  *Sources:* [*U.S. EPA*](https://www3.epa.gov/ttnchie1/ap42/ch02/final/c02s05.pdf)*,* [*CCAC*](https://www.ccacoalition.org/en/activity/open-agricultural-burning) |

# Air Quality and Climate Management Plan (AQCMP) Development Process

*This section outlines the various processes that contributed to the development of the AQCMP with more detail in the following sections.*

## Stakeholder Engagement in the AQCMP Development Process

*This section summarizes stakeholder engagement (both outside and within the government) that has occurred in the development of the proposed standards, climate policies, and NDCs. Due to the nature of the integrated air quality and climate management plan, this will include a cross-sector range of governmental departments (transportation, energy, buildings and housing, environment, air quality, etc.). In addition, this may include different jurisdictions, from local municipal departments to state, federal, or global partners. Coordination across jurisdictions is crucial in addressing local and global air pollutants, as policies may result in emissions leakage (for example, if one jurisdiction passes more stringent policies than surrounding areas, then emitting firms may move to a different, less stringent jurisdiction).*

*Another key component in the AQCMP development process is public engagement. Air pollution and climate impacts disproportionately affect both low-income and historically disadvantaged communities; therefore, it is crucial to include the public in decision-making processes. Public input can help inform which areas may be local hotspots of pollution in order to target actions.*

## Current Air Quality Monitoring Network, Emissions Inventory, and other Data Sources

*This section discusses the current air quality monitoring network and air quality data considered during the baseline characterization and standards development. This should also include any available greenhouse gas emissions inventories, with a particular focus on short-lived climate pollutants. Maps and summary statistics of the air quality monitors should be included here.*

## AQCMP Development: Analytic Steps

*Previous AQMPs have been developed through a process of collaboration and consultation with stakeholders in industry and government, with support from the USEPA (*[*find examples in section 9*](#_Tools_and_Resources)*). The process typically includes the steps listed below. Megacity Partner organizations and the host cities should provide relevant details, analyses undertaken, and collaborators included in each step.*

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| --- | --- |
| Wrench with solid fill ***Open book with solid fill*** | [*See Section 9 for tools and resources***.**](#_Tools_and_Resources) |
|  |  |

1. ***Review and update of emissions and ambient standards, including greenhouse gas emissions with a focus on SLCPs***.
2. ***Analysis of emissions source contributions. This should include conventional air pollutants such as particulate matter, nitrogen dioxide, and sulfur dioxide, as well as SLCPs such as black carbon and methane, and greenhouse gases such as carbon dioxide, methyl bromide, and chlorofluorocarbons (CFCs).***
3. ***Evaluation of air quality (AQ) monitoring data and capacity for greenhouse gas inventories.***
4. ***Estimation of current and projected future health burden of air quality, projected increases in emissions from air pollutants and greenhouse gases.***
5. ***Establishment of goals and objectives for the plan.***
6. ***Development of a detailed implementation plan.*** *Achieving the goals and objectives of the integrated AQCMP requires a detailed implementation plan – this is proposed in Section 6 of this AQCMP and will be continuously updated through stakeholder engagements and as part of the ongoing monitoring and evaluation of the AQCMP’s effectiveness, which is outlined in Section 6.*

# Summary of the Air Quality and Emissions Baseline Characterization

*The air quality baseline reflects all air pollution regulations, and policies currently in place or signed into law and adjusted to reflect a future economic growth scenario. Previous AQMPs have estimated future emissions growth at the same rate of projected GDP growth or projected growth of individual source sectors; discussions with the host agency will inform and drive the projected growth assumptions. Overall, the baseline reflects current emission sources, their expected trends for the foreseeable future, and current air quality. The baseline characterization also has implications for health status and includes the state of governmental air quality management capacity, national and local. It may also include projections for shifting trends in energy use (e.g. to more renewable sources).*

*For the greenhouse gas emissions component, the baseline is often established in the NDC and is referred to as the reference case. Where possible, it is helpful to lay out the key assumptions of the reference case in terms of energy use and growth over time as well as existing policies that are incorporated in the reference case.*

## Baseline Emissions and Atmospheric Conditions

*This section describes the set of sources including point sources (e.g., industrial sites), mobile sources (vehicles), and area sources, both from naturally occurring (wind-blown dusts and sea salt) and man-made (cook stoves and open burning of wastes) sources, covering greenhouse gas emissions and SLCPs in addition to conventional air pollutants. This section will also include information regarding relevant meteorological conditions affecting air quality and demographic characteristics.*

## Expected Emissions Trends

*The expected emissions trends section will detail what is known regarding expected emissions growth. If actual emission trend projections are not available, they can be forecasted using projections for the priority emission sources, such as projected growth of vehicle fleet, GDP, and population within the metropolitan area. For integration of conventional air quality and GHG emissions reduction goals, reference case trends in fossil- and renewable-based energy consumption are also critical. Methane emissions require analysis of the agriculture sector, particularly livestock, in addition to oil and gas exploration activity.*

## Ambient Air Quality

*This section contains information on ambient air quality, including the data sources for the information. This includes government and academic research, as well as ground-based monitoring. Exhibit 5 describes connections between climate and air pollution.*

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| **Exhibit 5: Connections Between Climate Change and Air Pollution** |
| The connections between climate change and air pollution extend beyond an overlap in pollutant emissions. Climate change can lead to increased temperatures in a region (for example, a heat wave that is likely longer and hotter than it would have been with lower GHG concentrations), which can increase ozone formation. Climate change has also been linked to an increased frequency and intensity of wildfires, which results in additional PM2.5 pollution. Intensified drought can lead to dried out soil and increased PM2.5 pollution from dust, and intensified rainfall can lead to excess moisture and mold. The aggravation of air pollution impacts from climate change is yet another motivation towards implementing an integrated climate and air quality plan.  *Source:* [*Center for Climate Change and Health*](https://climatehealthconnect.org/wp-content/uploads/2016/09/AirQuality.pdf) |

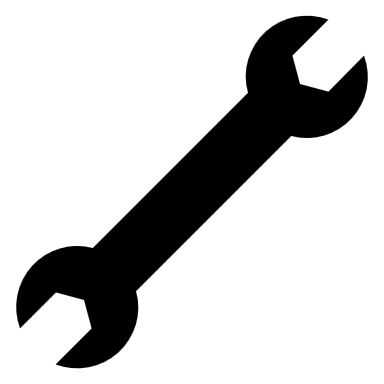
## Health Implications of the Baseline Air Quality Scenario

*Quantifying the current and/or projected health burden is compelling evidence for motivating action on air pollution. The baseline health impact estimates the health implications of the baseline air quality scenario and the burden of particulate matter air pollution. Previous AQMPs have used US EPA’s Environmental Benefits Mapping and Analysis Program – Community Edition (BenMAP-CE) tool to calculate the baseline health burden estimate. Others have used the Long-range Energy Alternatives Planning (LEAP) -Integrated Benefits Calculator (IBC) from the Climate and Clean Air Coalition (CCAC). Future scenarios of projected air quality and health impacts should also be included in this section if data and resources permit. Exhibit 6 provides examples of SLCP health effects.*

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| **Exhibit 6: Health Effects of SLCPs** |
| SLCPs are important emissions to target not only for their near-term climate impacts, but also because of their significant health impacts. Exposure to black carbon, an SLCP, has been linked to all-cause and cardiopulmonary mortality, as well as increased hospital visits for cardiovascular and respiratory diseases. Black carbon is typically classified as PM2.5 pollution which penetrates deeply into lungs and is also created from processes of combustion, which may be more dangerous than other PM2.5 particles.  The health effects of ozone, another SLCP, have also been widely studied. Exposure to ozone is linked to increased asthma incidence, premature mortality, changes in lung function, and general harmful respiratory impacts. However, tropospheric ozone is not emitted directly. Instead, it is created from a combination of inputs such as methane, carbon monoxide, NOx, and VOCs. Methane itself is another SLCP, making it a key target in climate and air pollution action.  *Source:* [*Reducing Global Health Risks Through Mitigation of Short-Lived Climate Pollutants, WHO and CCAC*](https://apps.who.int/iris/bitstream/handle/10665/189524/9789241565080_eng.pdf?sequence=1&isAllowed=y) |

## Climate Implications of the Baseline Emissions Scenario

*This section should include the GHG emissions potential of key emitting sources, and the resulting CO2 equivalent radiative forcing potential of the GHG emissions overall. This can even be quantified using a measure of the social cost of carbon to represent economic damages (national or global depending on the measure) from the emissions. Exhibit 7 describes the social cost of carbon metric and Exhibit 8 describes radiative forcing.*

***Tools: Long-term Energy Analysis and Planning (LEAP) from the Stockholm Environment Institute and*** [***LEAP Integrated Benefits Calculator***](https://leap.sei.org/default.asp?action=home)

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| **Exhibit 7: The Social Cost of Carbon** |
| The social cost of carbon is an estimated metric of the economic damages that occur from the addition of one ton of carbon dioxide into the atmosphere. Historically, the social cost of carbon has been used by policymakers to quantify the benefits or costs that would result from a policy that changes the level of emissions in a given scenario. The social cost of carbon is determined by studying the impacts on agriculture, health, energy use, and other aspects of the economy that result from additional CO2 in the atmosphere, using scientific studies and modeling techniques. Some calculated measures of the social cost of carbon consider global impacts from increased emissions, whereas others restrict analysis to national impacts. Other estimates are also available for the social cost of pollutants such as methane and nitrous oxide. Determining the economic benefits from greenhouse gas reduction when reducing emissions in your city can be a helpful tool in demonstrating benefits of policy action.  *Source:* [*Social Cost of Carbon 101, Resources for the Future*](https://media.rff.org/documents/SCC_Explainer.pdf) |

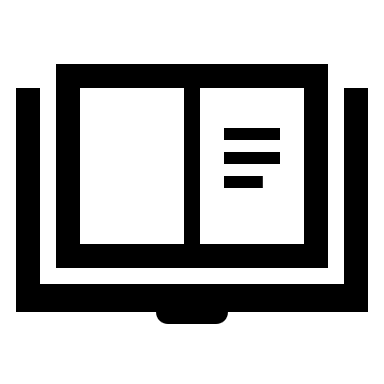
|  |
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| **Exhibit 8: Radiative Forcing** |
| Radiative forcing refers to the amount of warming or cooling that a given input, such as a greenhouse gas, causes on Earth. As can be seen in Exhibit 8a, long-lived greenhouse gases have net positive radiative forcing effects, causing warming on Earth. However, other pollutants such as aerosols can have a negative radiative forcing effect, meaning they counteract some warming. When considering climate change and air pollution planning, it is helpful context to consider the competing effects of aerosol reduction – that is, improvements in public health but a reduction in global cooling.  Bar graph showing the total amount of radiative forcing caused by human activities—including indirect effects—between 1750 and 2011.  *Exhibit 8a, source:* [*Climate Change Indicators: Climate Forcing, EPA*](https://www.epa.gov/climate-indicators/climate-change-indicators-climate-forcing#%20) |

## Capacity Assessment

*This section includes an analysis of the governmental, academic, research, and local resources available to enhance air quality and climate management efforts. Table 1 can be used to provide a summary of capabilities for each major component of a complete air quality and climate management system (AQCMS). For each component of the AQCMS listed in Table 1, an initial status assessment and any potential capacity gaps should be filled in the corresponding columns.*

Table 1. Status of Air Quality and Climate Management System Capabilities

| COMPONENT OF AQCMS | INITIAL ASSESSMENT OF STATUS | POTENTIAL CAPACITY GAPS |
| --- | --- | --- |
| Laws and Regulations | - | - |
| Emissions Inventory, including for SLCPs | - | - |
| Ambient and Source Air Quality Monitoring | **-** | **-** |
| Air Pollution Dispersion/Fate and Transport Modeling | **-** | **-** |
| Data Analysis and Interpretation | - | - |
| Public Participation and Environmental Justice | - | - |
| Control Strategy Planning and Development | - | - |
| Compliance and Enforcement | - | - |

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Example: see Accra, Ghana’s AQMP [here](http://www.epa.gov.gh/epa/sites/default/files/downloads/publications/Greater%20Accra%20Region%20Air%20%20Quality%20Management%20Plan%202%20Oct%20%202018%20updated.pdf)

# Gaps and Limitations

*Next steps identified in the AQCMP should aim to fill systemic, capacity, and resource gaps identified throughout the AQCMP drafting process, and Partnership more generally. This section should list and describe major areas where capacity limitations can and should be addressed to further enhance the ability to plan, implement, monitor, and evaluate emissions reduction performance. The examples should be specific to the city, targeted, and may include the following:*

## Enhance AQ monitoring capabilities

*Text will go in this space.*

## Improve air pollution and GHG emissions inventories

*Text will go in this space.*

## Improve access to laboratory facilities for air pollutant source tracing and source apportionment

*Text will go in this space.*

## Improve national-city cooperation

*Text will go in this space.*

*Note: This component may directly address coordination of Nationally Determined Contributions for GHG mitigation at national-scale with city-scale GHG and air quality objectives.*

## Enhance education and outreach on air pollution issues

*Text will go in this space.*

## Develop inclusive public participation

*Text will go in this space.*

# Overall Objective and Goals of the AQCMP

*The centerpiece of the AQCMP is establishing an overall air quality and climate objective for the Megacity, for example:*

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| “The city halves carbon emissions by 2035, as ambient particulate air quality is brought into full compliance with national standards and the state of compliance is maintained with economic development in the region.” |

*To meet this objective, this section should set forward actionable goals by which the objective will be fulfilled, for example:*

* ***Goal 1:*** *Ambient concentrations of air pollutants comply with the relevant ambient air quality standards because of planned emissions reductions*
* ***Goal 2:*** *Greenhouse gas emissions and SLCPs are monitored and on track to meet emissions reduction goals*
* ***Goal 3:*** *Cooperative governance promotes the implementation of the AQCMP*
* ***Goal 4:*** *Air quality management is supported by effective systems and tools*
* ***Goal 5:*** *Air quality decision-making is informed by sound research*
* ***Goal 6:*** *Knowledge and understanding amongst decision-makers, stakeholders, and the general public is improved according to an education and outreach plan*

*When developing goals to fulfill the main objective of the AQCMP, see Exhibit 9 to consider a focus on SLCPs to tackle air pollution and climate change. Exhibit 10 provides examples of different mitigation actions that may be of interest. Finally, Exhibit 11 includes an overview of cost considerations for mitigation actions.*

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| **Exhibit 9: In Tackling Air Pollution and Climate Change, Focus on SLCPs** |
| Focusing on SLCPs reduces local air pollution and has a bigger impact in the short-term on climate change and warming. Many of these measures can be tackled at the city-level and allow for increased ambition on the air pollution and climate change mitigation fronts.  A picture containing timeline  Description automatically generated  *Exhibit 9a, source:* [*Opportunities for Increasing Ambition of Nationally Determined Contributions Through Integrated Air Pollution and Climate Change Planning: A Practical Guidance Document, CCAC*](https://www.ccacoalition.org/en/resources/opportunities-increasing-ambition-nationally-determined-contributions-through-integrated)*, pg. 12* |
| **Exhibit 10: Example Mitigation Actions** |
| |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Sector | | Mitigation action | Certainty of major SLCP-related climate benefit | Aggregate level of potential health benefit | Main health benefits | Potential level of CO2 reduction  co-benefit | | Transport | Support active and rapid mass transport | | High | High | * Improved air quality * Less crop damage and extreme weather * Increased physical activity * Reduced noise * Fewer road traffic injuries | High | | Higher vehicle emissions/efficiency standards | | High | Medium-high | * Improved air quality * Less crop damage and extreme weather | High | | Agriculture | Improved manure management | | Low-medium | Low-medium | * Reduced zoonotic disease * Improved indoor air quality | Low | | Reduced open burning on agricultural fields | | Medium | Low-medium | * Improved air quality * Less crop damage and extreme weather | Low | | Household air pollution | Low-emission stoves and/or fuel switching to reduce solid fuel use | | Medium-high | High | * Improved air quality * Less crop damage and extreme weather * Lower violence and injury risk during fuel collection * Fewer accidental burns | Medium | | Improved lighting to replace kerosene lamps | | Medium | Medium | * Improved air quality * Less crop damage and extreme weather * Fewer burns * Fewer poisonings | Low-medium | | Energy and industry | Switch from fossil fuels to renewables for large-scale power production | | Low | High (coal/oil)  Low-medium (gas) | * Improved air quality * Less crop damage and extreme weather * Fewer occupational injuries | High (coal/oil)  Medium-high (gas) | | Improved brick kilns | | Low-medium | Medium | * Improved air quality * Less crop damage and extreme weather | Low-medium |   *Adapted from* [*Reducing Global Health Risks Through Mitigation of Short-Lived Climate Pollutants, WHO and CCAC*](https://apps.who.int/iris/bitstream/handle/10665/189524/9789241565080_eng.pdf?sequence=1&isAllowed=y)*,* *Table 8. See source for more information.* |

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| **Exhibit 11: Cost Considerations** |
| This table considers the cost required to abate carbon emissions, as well as the emissions reduction potential of that action by 2030. Some actions are estimated to have higher benefits than costs, resulting in a net benefit.   |  |  |  | | --- | --- | --- | | Emissions Reduction Option | Cost (USD per tCO2-eq) | Global Emissions Reduction Potential for 2030 (GtCO2-eq)\*\* | | Solar Energy | Ranges from net benefit to $100 | 2.0-7.0 | | Reducing methane and N2O in agriculture\* | $0 to $50 | 0.11-0.84 | | Light duty vehicles – fuel efficiency | Net benefit | 0.6 | | Light duty vehicles – electric vehicles | Net benefit | 0.5-0.7 | | Efficient lighting, appliances, and equipment | Net benefit | 0.54-0.91 |   \*Refers to reduced enteric fermentation, improved manure management, nutrient management, rice cultivations  \*\* City-scale emissions reduction potential could vary from what is presented here, depending on local conditions  *Source:* [*IPCC WG III contribution to the Sixth Assessment Report, Table 12.3*](https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_Chapter_12.pdf) *and* [*Summary for Policymakers Figures*](https://www.ipcc.ch/report/ar6/wg3/figures/summary-for-policymakers) |

# Implementation Plan

*The implementation table in Exhibit 12 is an example of outlined steps designed to help achieve one goal of Addis Ababa’s AQMP. The implementation is detailed and specific, and includes the fundamentals of program execution, monitoring, and evaluation – concrete activities, responsible agencies, accountable timelines, and performance indicators to track progress over time. It also includes a preliminary categorial estimate of the external funding resources needed to achieve each objective listed. The legend for the categorical entries in that column is provided in Table 2, which can be amended based on the scale of the outlined objectives. Table 3 provides an example of a suite of goals and action items that may be included within an implementation plan to meet the AQCMP objective, which can be adapted for use in this plan.*

TAble 2. External Funding Categories

|  |  |
| --- | --- |
| **Symbol** | **Meaning** |
| $ | External resources of USD $50,000 or less are needed to achieve the objective. |
| $$ | External resources of between $50,000 and $100,000 are needed. |
| $$$ | External resources of greater than $100,000 are needed. |
| Unknown | Resource needs are currently unknown pending a more comprehensive scoping effort. |
| None | Can be funded by using internal, allocated resources or previously secured funding from external sources. |

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| **Exhibit 12:** Example Table from Open book with solid fill [Addis Ababa’s Air Quality Management Plan,](https://www.epa.gov/system/files/documents/2021-11/final-aqmp-addis-ababa.pdf) 2021 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Goal 1: Ambient concentrations of air pollutants comply with the relevant ambient air quality standards because of planned emission reductions** | | | | | | |
| **Objectives** | **Activities** | **Mandatory Responsibility** | **Participatory Responsibility** | **Time-frames** | **Indicators** | **Resource need** |
| Review the national ambient air quality standards and other relevant research and information, including other African nations and WHO | Environmental Protection and Green Development Commission (EPGDC) will monitor and review the process that the Environment, Forest and Climate Change Commission (EFCCC) is pursuing at the national level, because the Addis standards cannot be less stringent than the national standards | EFCCC | EFCCC, to communicate with EPGDC about standards development | 2021-2022 | EFCCC publishes findings of their review | None |
| Establish city-level ambient standards | Review national standard, decide whether a standard is needed at city-level | Addis EPGDC | All members of Advisory Committee | 2022-2023 | Two years after completion of National ambient standard .20 decision is made about whether a new Addis Ababa (AA) ambient standard is needed - if yes, then new standard is published | None |
| Complete pilot-level research on existing vehicle emissions | Addis Ababa Road and Transport Bureau (AAT Bureau) will complete work with C40 to test emissions for 380 vehicles, prepare benefit-cost analysis for option of adopting Euro standards | AAT Bureau | C40, AAEPGDC, NMA, EFCCC | 2021 | Findings of pilot tests are published by AAT Bureau. Findings should include a specific recommendation on the type of equipment that will be used to enforce a new city-level standard | None – already funded through C40 |
| Establish emissions standards for vehicles for Addis Ababa | Addis Driver & Vehicle Licensing Authority (DVLCA) and AAT Bureau develops an emissions standard proposal for review by the Addis Ababa Transport Authority and the Addis EPGDC | Addis Transport Bureau, supported by Addis EPGDC, DVLCA | EFCCC, Mayor’s office | 2021-2022 | New emissions standards are developed and published | $ |

*Other objectives listed below are examples of what can be included in this section:*

TAble 3. Outline of Example action items to meet AQCMP goals

| **Goal 1: Ambient concentrations of air pollutants comply with the relevant ambient air quality standards because of planned emissions reductions** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Objectives** | **Activities** | **Mandatory Responsibility** | **Participatory Responsibility** | **Time-frames** | **Indicators** | **RESOURCE NEED** |
| Update ambient standards | - | - | - | - | - |  |
| Reduce emissions from personal vehicles | - | - | - | - | - |  |
| Reduce dust from unpaved roads | - | - | - | - | - |  |
| Reduce emissions from industrial sources | - | - | - | - | - |  |
| Reduce open burning emissions | - | - | - | - | - |  |

| **Goal 2: Greenhouse gas emissions are monitored and on track to meet emissions reduction goals** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Objectives** | **Activities** | **Mandatory Responsibility** | **Participatory Responsibility** | **Time-frames** | **Indicators** | **RESOURCE NEED** |
| Develop robust emissions monitoring and inventory | - | - | - | - | - |  |
| Set mitigation targets in cooperation with regional or national plans | - | - | - | - | - |  |
| Set emissions reduction targets per sector | - | - | - | - | - |  |
| Develop actions to reach emissions reduction targets, focusing specifically on SLCPs | - | - | - | - | - |  |

| **Goal 3: Cooperative governance promotes the implementation of the AQCMP** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Objectives** | **Activities** | **Mandatory Responsibility** | **Participatory Responsibility** | **Time-frames** | **Indicators** | **Resource need** |
| Align national and local vehicle emissions standards | - | - | - | - | - |  |
| Implement and enforce vehicle emissions inspections | - | - | - | - | - |  |
| Align local climate goals and GHG reduction targets with national NDCs | - | - | - | - | - |  |
| Develop framework for cross-sector and cross-city collaboration between municipal departments | - | - | - | - | - |  |

| **Goal 4: Air quality management is supported by effective systems and tools** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Objectives** | **Activities** | **Mandatory Responsibility** | **Participatory Responsibility** | **Time-frames** | **Indicators** | **Resource need** |
| Effectively collect, manage, and disseminate emissions and air quality data to partners | - | - | - | - | - |  |
| Clarify data sharing and confidentiality policies | - | - | - | - | - |  |
| Enhance monitoring capabilities | - | - | - | - | - |  |
| Enhance “bottom-up” (building up from source to ambient AQ) systems and tools | - | - | - | - | - |  |

| **Goal 5: Air Quality Decision-making is informed by sound research** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Objectives** | **Activities** | **Mandatory Responsibility** | **Participatory Responsibility** | **Time-frames** | **Indicators** | **Resource need** |
| Coordinate and align public health air quality research being conducted by academia | - | - | - | - | - |  |
| Utilize existing monitor information to identify patterns and trends that can inform AQCMP implementation | - | - | - | - | - |  |
| Develop local and external capabilities to perform analysis | - | - | - | - | - |  |
| Adopt globally recognized and supported decision-making tools (e.g., CCAC/SEI’s LEAP tool) to support integration of air quality and climate mitigation commitments | - | - | - | - | - |  |

| **Goal 6: Knowledge and understanding amongst decision-makers, stakeholders, and the general public is improved according to an education and outreach plan** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Objectives** | **Activities** | **Mandatory Responsibility** | **Participatory Responsibility** | **Time-frames** | **Indicators** | **Resource need** |
| Enhance understanding among general public | - | - | - | - | - |  |
| Inform decision makers to take action on the key activities in AQCMP and air policy decision making | - | - | - | - | - |  |
| Assist stakeholders and the regulated community to understand and comply with regulations under the AQCMP | - | - | - | - | - |  |

# Monitoring and Evaluation

*In order to meet the main objective established, Section 7 outlines the long-term plan to evaluate progress towards the goals and objectives.*

*Exhibit 13 provides a summary of the ongoing process of air quality and climate mitigation management envisioned. Steps 1 through 3 have been used to formulate this first draft of the plan. Available air quality and climate/GHG emissions data have been used to assess the current situation and identify key sources. These results have in turn been used to prioritize actions for the key industrial point sources, for continued progress in reducing emissions from mobile sources (using both tailpipe controls and fuels content regulation), and for area sources such as agriculture, cookstoves, and open burning. This plan represents the first step in taking action (Step 4).*

|  |
| --- |
| **Exhibit 13: Air Quality and Climate Management Process Cycle** |
|  |

*Note that the review will also evaluate the state of emissions drivers, including faster or slower growth in emissions rates, air pollutant exposures, and the economy. The 5-year formal evaluation will also include an update on the availability of financing for implementation of the plan and to support meaningful changes in emissions rates and transition to new technologies, particularly for point sources but also for the turnover of the mobile source fleet to cleaner technologies and the availability in retail settings of cleaner, low sulfur diesel and gasoline. Note that financing of GHG emissions reductions, integrated with AQ management planning, opens additional opportunities for international financing of emissions mitigation actions, such as the Green Climate Fund.*

# Conclusion

*Include final conclusions and next steps for the AQCMP.*

# Tools and Resources

| Exhibit 14: Wrench with solid fill Tools | | | | | |
| --- | --- | --- | --- | --- | --- |
| NAME | TOOL TYPE | CREATED BY | PURPOSE | INPUTS REQUIRED | ACCESSIBILITY |
| The  Long-range Energy Alternatives Planning- Integrated Benefits Calculator ([LEAP-IBC](https://leap.sei.org/default.asp?action=home)) | Health benefits estimator  Heart with pulse outline  Emissions estimator  Power Plant with solid fill  Measure decision supportDecision chart with solid fill | Developed by Stockholm Environment Institute (SEI) with US EPA and Daven Henze at the University of Colorado, with support of the Climate and Clean Air Coalition (CCAC) | LEAP is used for tracking energy consumption, production, and resource extraction for all sectors, including GHG emissions and air pollutants. LEAP-IBC uses emissions scenarios from LEAP to find national estimates for avoided premature mortality and losses from crops, as well as climate impacts. The tool estimates benefits from addressing SLCPs, reducing GHGs, and reducing local and regional air pollutants. | To calculate emissions from a source sector, users input the activity and emission factor or use default values. Default architecture can be used to model sectors in different levels of detail based on available data. | Required to have a license. |
| Environmental Benefits Mapping and Analysis Program - Community Edition ([BenMAP-CE](https://www.epa.gov/benmap)) | Health benefits estimator  Heart with pulse outline | US EPA | Calculates the number and economic value of air pollution-related deaths and illnesses. | Database includes many concentration-response relationships, population, and health and economic data. Default data focuses on a US context. Users can upload population and incidence data, air quality monitor data or models, relevant concentration-response functions for their specific location, preferred valuation functions, and more. | BenMAP-CE is open-source software and can be used in international formats. |
| Greenhouse Gas and Air Pollution Interactions and Synergies ([GAINS](https://iiasa.ac.at/models-and-data/greenhouse-gas-and-air-pollution-interactions-and-synergies)) | Health benefits estimator  Heart with pulse outline  Emissions estimator  Power Plant with solid fill  Measure decision supportDecision chart with solid fill | International Institute for Applied Systems Analysis | Includes data supplied from countries, emission inventories, and international statistics, assessing emissions through 2050. Creates estimates for emissions reductions from different emission control measures. Helps to determine cost-effectiveness and maximize net benefits of policies. | Global data is already available in the GAINS tool to be used and analyzed, including emissions, air quality and impacts, and more. Depending on permissions, users can modify, create, or update data for calculations, and create unique emissions scenarios. | Many features available as an open-access online tool, others require additional permissions. |
| Transport Emissions Evaluation Model for Projects ([TEEMP](https://www.itdp.org/2012/08/06/transport-emissions-evaluation-model-for-projects-teemp-brt/)) | Health benefits estimator  Heart with pulse outline  Measure decision supportDecision chart with solid fill | Institute for Transportation and Development Policy | Suite of Excel models to evaluate the impacts of different transportation projects (GHG, air pollution, and other impacts). Summarizes reductions in PM, NOx, and CO2 from different actions. | [Link to manual.](https://www.itdp.org/wp-content/uploads/2022/03/GEF_CalculatingGHGbenefits_webCD.pdf) Can fill in local data such as vehicle types and fuel use. | Available to all for free. |
| Computer Programme to calculate Emissions from Road Transport ([COPERT](https://www.emisia.com/utilities/copert/)) | Emissions estimator  Power Plant with solid fill | Coordinated by European Environment Agency (EEA), scientific development managed by the European Commission’s Joint Research Centre. | Developed for use to estimate emissions from road transport. | Uses data on vehicle population, mileage, speed, temperature, and other factors to calculate emission and energy consumption for a region. | Available and free for use in research, scientific, and academic applications. |
| [Air Quality Benefits Tool](https://cdn.locomotive.works/sites/5ab410c8a2f42204838f797e/content_entry5ab410fb74c4833febe6c81a/5f2aacd09018df00ae910d9a/files/BUCA_tool_blank_V3.xlsx?1596632687) | Health benefits estimator  Heart with pulse outline  Measure decision supportDecision chart with solid fill | C40 Cities Climate Leadership Group | Excel based model to estimate health benefits and valuation of different policies for PM2.5 and NO2 emissions. Beneficial for completing simpler calculations without the expertise needed for BenMAP-CE. | City-specific data on population, air pollution, and other baseline data. | Available to all for free. |

| Exhibit 15: Open book with solid fill Resources for Guiding AQCMP Development | | |
| --- | --- | --- |
| NAME | CREATED BY | PURPOSE |
| [Clean Air, Healthy Planet](https://www.c40knowledgehub.org/s/article/Clean-air-healthy-planet-A-framework-for-integrating-air-quality-management-and-climate-action-planning?language=en_US) | C40 Cities | Framework for integrating air quality management and climate action planning. Explains background on climate action planning and air quality management planning, the advantages to an integrated planning approach, and different steps to integrate planning. |
| [Opportunities for Increasing Ambition of Nationally Determined Contributions Through Integrated Air Pollution and Climate Change Planning](https://www.ccacoalition.org/en/resources/opportunities-increasing-ambition-nationally-determined-contributions-through-integrated) | Climate and Clean Air Coalition (CCAC) | Guidance document to identify mitigation actions to increase climate change ambition, based on CCAC’s Supporting National Action and Planning (SNAP) initiative. It highlights the reduction of SLCPs in order to meet targets. |
| [National Planning for Reducing Short-lived Climate Pollutants](https://www.ccacoalition.org/en/resources/guidance-document-national-planning-reducing-short-lived-climate-pollutants-snap) | CCAC | Guideline for countries to include SLCP strategies in their national planning. |
| [Co-Benefits of Climate Change Mitigation](https://unece.org/DAM/Sustainable_Development_No._2__Final__Draft_OK_2.pdf) | United Nations Economic Commission for Europe (UNECE) | Brief overview of the co-benefits that come with climate change mitigation, with a specific emphasis on air quality. |
| [Reducing Global Health Risks Though Mitigation of Short-lived Climate Pollutants](https://apps.who.int/iris/bitstream/handle/10665/189524/9789241565080_eng.pdf?sequence=1&isAllowed=y) | CCAC, WHO | Comprehensive overview of health effects and mitigation options for SLCPs. |
| [Air Pollution in Asia and the Pacific: Science Based Solutions](https://www.ccacoalition.org/en/resources/air-pollution-asia-and-pacific-science-based-solutions-summary-full-report) | CCAC | Impacts of air pollution in Asia and the Pacific, and health, environmental, and other developmental benefits of different measures. |
| [Clean Air Plan](http://www.metrovancouver.org/services/air-quality/AirQualityPublications/Clean-Air-Plan-2021.pdf) (Air Quality and Climate Change) | Metro Vancouver | Example air quality and greenhouse gas management plan to reduce emissions of pollutants (including GHGs) and reduce associated impacts over the next ten years. |
| [Côte d'Ivoire’s Nationally Determined Contributions Plan](https://unfccc.int/sites/default/files/NDC/2022-06/CDN_CIV_2022.pdf) | Côte d'Ivoire | Example national plan to highlight the reduction of SLCPs in nationally determined contributions. |
| [LA’s Green New Deal Sustainable City Plan](https://plan.lamayor.org/sites/default/files/pLAn_2019_final.pdf) | City of Los Angeles | Example city sustainability plan that incorporates air quality management and climate change mitigation considerations. |
| [The Greater Accra Metropolitan Areas Air Quality Management Plan](http://www.epa.gov.gh/epa/sites/default/files/downloads/publications/Greater%20Accra%20Region%20Air%20%20Quality%20Management%20Plan%202%20Oct%20%202018%20updated.pdf) | Accra, Ghana | Example Air Quality Management Plan using the Megacities framework. |
| [Addis Ababa City Air Quality Management Plan](https://www.epa.gov/system/files/documents/2021-11/final-aqmp-addis-ababa.pdf) | Addis Ababa, Ethiopia | Example Air Quality Management Plan using the Megacities framework. |

1. Note: This template, previously the Air Quality Management Plan (AQMP), has been updated to consider climate impacts in addition to air quality. Each city can determine whether they would like to create an integrated AQCMP or a focused AQMP, but this management plan continues to be referred to as an AQMP in the suite of related template documents. [↑](#footnote-ref-2)