National Clean Air Policy (NCAP)

Ministry of Climate Change
Government of Pakistan

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Contents

Foreword

Air pollution has been one of the most pressing issues that has impacted Pakistan for the last few decades, with the air quality indices of the metropolitan areas reaching hazardous limits. Achieving the commitments of Nationally Determined Contributions (NDCs) as well as the Sustainable Development Goals (SDGs) by 2030 requires implementing coordinated and concerted strategies for air pollutants that maximizes synergies. Mitigating short-lived climate pollutants (SLCPs) with high global warming potential is the kind of action that offers multiple dividends in terms of mitigating greenhouse gas (GHG) emissions as well as controlling air pollution contributing to achieving both the NDCs and SDGs.

One of the major impacts of climate change that Pakistan is facing is internal migration toward cities for better livelihood opportunities. Pakistani cities continue to grow, offering employment opportunities, but rapid urbanization has been accompanied by environmental problems such as air pollution, ineffective waste management, traffic congestion, and the destruction of ecosystems.

This Policy informed by the National Inventory for Short-Lived Climate Pollutants (SLCP) is a beginning. It sets a roadmap for change by identifying a contextualized solution for Pakistan to manage air pollutants alongside other GHGs. I congratulate the contributors on compiling this policy document and bridging the knowledge gap for decision-makers through various scenarios to indicate priority actions and co-benefits in addressing of global warming and environmental damages.

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Acknowledgement

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Abbreviations and Acronyms

ADB	Asian Development Bank
AEDB	Alternate Energy Development Board
AJK	Azad Jammu and Kashmir
ARI	Acute Respiratory Infections
ALRI	Acute Lower Respiratory Infections
AQI	Air Quality Index
AQM	Air Quality Management
CDA	Capital Development Authority
CO	Carbon monoxide
CO_2	Carbon di oxide
CSR	Corporate Social Responsibility
CWDs	Communication and Works Departments
EPA/s	Environmental Protection Agency/ Agencies
EPDs	Environmental Protection Departments
EV	Electric Vehicle
G-B	Gilgit-Baltistan
GCISC	Global Change Impact Studies Center
GDP	Gross Domestic Product
GHG	Greenhouse Gases
HFCs	Hydro-Flouro Carbons
IAP	Indoor Air Pollution
ICS	Improved Cook Stoves
IEA	International Energy Association
IWMS	Integrated Waste Management System
KW	Kilo Watt
LEAP	Low Emissions Analysis Platform
MVEs	Motor Vehicle Examiners

NCAC	National Clean Air Conference
NDC	Nationally Determined Contribution
NCAC	National Clean Air Conference
NCAP	National Clean Air Policy/ Programme
NCCP	National Climate Change Policy, 2021
NEECA	National Energy Efficiency and Conservation Authority
NEQS	National Environmental Quality Standards
NOx	Nitrogen Oxide
m^{-3}	Cubic meter
O_3	Ozone
MoCC	Ministry of Climate Change
PEPA	Pakistan Environment Protection Act, 1997
PEPC	Pakistan Environmental Protection Council
PGDP	Works Departments
PM	Particulate Matter
POP	Persistent Organic Pollutants
SLCP	Short-Lived Climate Pollutants
SMART	Self-Monitoring, Analysis and Reporting
SUPARCO	Pakistan Upper Space and Atmospheric Research Commission
SO_2	Sulphur di Oxide
TA	Technical Assistance
USD	United States Dollar
WB	World Bank
WHO	World Health Organization
µg	Micro gram

Executive Summary

Pakistan is currently facing a very serious level of air pollution with some urban areas reaching hazardous pollution levels across the year. In 2019, Lahore's ambient Particulate Matter ($PM_{2.5}$) concentrations were as high as 123 µg m^{-3}, 24 times higher than the World Health Organization (WHO) Air Quality Guideline. Besides Short-Lived Climate Pollutants (SLCPs) air pollution also includes black carbon and tropospheric ozone, and Greenhouse Gas (GHG) emissions. Reducing these will have significant co-benefits while supporting achievement of the climate change objective as outlined under the National Climate Change Policy (NCCP) 2021.

The National Clean Air Policy (NCAP) aims to provide a framework for improving air quality in Pakistan. The NCAP is a national document and therefore focuses on actions at the national scale that can achieve improvements in air quality. However, the provinces of Pakistan have a crucial role in implementing measures to improve air quality within their areas of responsibility.

The NCAP includes three core components, taken together, can allow key institutions at national and provincial levels to understand the air quality status and identify, evaluate, implement and monitor mitigation actions to reduce air pollution.

Pakistan's first National Inventory for Short-Lived Climate Pollutants (SLCP) compiled in 2022 identifies the following priority actions:

- Improved vehicle inspection and maintenance
- Upgradation of fuel quality standards to Euro-5 or Euro-6
- Enhanced introduction of two/three wheeler electric vehicles
- Development and improvement of mass transit systems
- Improved traffic management planning
- Promote low carbon fuel efficient infrastructure and technology within railways, maritime, and aviation sectors
- Promote urban forestry and management of green spaces
- Emission control in industry through compliance with emission standards
- Upgradation and management of brick kilns on clean technologies and practices
- Banning and promoting alternatives to crop burning
- Control of emissions from threshing and tilling
- Minimize and control forest fires through effective management
- Prohibition of open waste burning
- Improved waste management
- Use of improved and efficient cookstoves to reduce indoor air pollution
- Promote access to clean energy for indoor heating and cooking
- Promote energy efficiency and use of alternate energy across all sectors
- Promote clean energy in industrial sectors
- NCAP proposes establishment and strengthening of the institutional arrangements for effective coordination and implementation. It suggests ways and means of effective communication channels to enhance the outreach of information. The Policy also recommends strengthening research on priority aspects related to air pollution for facilitating informed decision making

The NCAP identifies one priority intervention in each of the five sectors with the aim of accelerating progress to reduce air pollutant emissions across all major sources. The five priority sectors are:

I. Transport: Implement Euro-5 and Euro-6 Fuel Quality Standards
II. Industry: Enforce emission standards for industries
III. Agriculture: Prevent burning of agricultural residues
IV. Waste: Prevent open burning of municipal solid waste
V. Households/ Residential: Promote use of low emission cooking technologies

The full implementation of these intervention in five priority sectors under NCAP will reduce $PM_{2.5}$ emissions by 38% in 2030 compared to the baseline scenario and by 21% compared to 2020 levels. By 2040, these five key interventions will achieve even larger emission reductions, reducing emissions by 81% in 2040 compared to the baseline scenario and by 70% compared to 2020 levels.

The World Health Organization (WHO) has established Air Quality Guidelines for the pollutants in 2021 which have highest impacts on human health, for both long and short-term exposure. These guidelines have been used as reference for setting targets in this Policy document. The proposed Air Quality Targets will ensure that the progress of the NCAP is monitored and progress is tracked.

The implementation mechanism of the NCAP requires that implementation plans at federal and provincial levels are devised. Moreover, resources would be required for the priority mitigation measures. Implementation of the NCAP will require active participation from stakeholders, including media, research institutions, civil society, and advocacy groups. The most polluting industries will be engaged to include air pollution reduction through enhance compliance and adoptions of actions as part of their Corporate Social Responsibility (CSR).

1. Introduction

1.1 Air Pollution in Pakistan

Air pollution has become a serious concern for the well-being of the citizens of Pakistan. According to the World Health Organization (WHO) Air Quality Database[1], concentrations of fine particulate matter ($PM_{2.5}$), the pollutant most damaging to human health, far exceeded WHO ambient air quality guidelines in 2022 for the protection of human health. In 2019, ambient $PM_{2.5}$ concentrations in Lahore were as high as 123 µg m^{-3}, which is at least twenty-four times higher than the WHO's Air Quality Guideline. The Air Quality Index (AQI) values collected from the *AirNow* data shows that during the winter months, many cities have an AQI of above 150 with Lahore often exceeding 400. Other cities, including Faisalabad, Islamabad, Karachi, Peshawar and Rawalpindi, had more or less similar air quality.

The $PM_{2.5}$ concentration in Pakistan shows an increasing trend across all provinces. The details are shown in Figure 1.

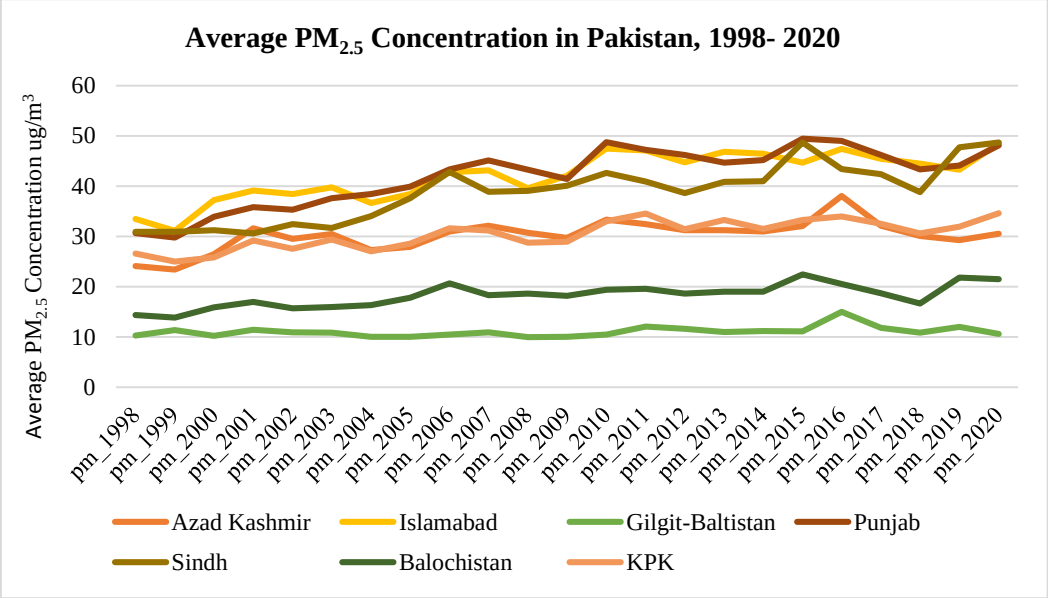


Figure 1. Average $PM_{2.5}$ Concentration in Pakistan, 1998-2020[2]

Key sources of air pollution in the country include, poor regulation of industrial and vehicular emissions, open burning of waste and land use planning issues. Another key factor is the rise in energy demand and use of fossil fuels as opposed to renewable energy sources such as wind energy and solar. The number of road vehicles in the country has also increased several folds, from 5.2 million in 2007 to 26.5 million in 2018.

[1] https://www.who.int/data/gho/data/themes/air-pollution/who-air-quality-database
[2] https://aqli.epic.uchicago.edu/the-index/

It is estimated that air pollution has reduced the average life expectancy across Pakistan by up to 2.7 years. According to the Global Burden of Disease, in 2019, 235,000 premature deaths were attributable to air pollution exposure in Pakistan[3]. Moreover, crop yields have witnessed a reduction due to smog which pose food security challenges and impacts ecosystem production. Several other studies and reports conclude that Pakistan is already facing severe economic and health impacts resulting from air pollution. The recent report from World Bank (WB) notes that air pollution could impose a loss of 6.5 percent of Gross Domestic Product (GDP) per year[4].

The country faces regular smog episodes in winter, which are linked to high pollutant concentrations, resulting in severe impact on environment and public health. Punjab experiences periods of low visibility due to fog, mist and smog between November and February each year for an average of 10 to 25 days. This is usually a regional event, covering vast expanse from New Delhi to Faisalabad and beyond. Mitigation measures that improve air quality can also reduce GHG emissions that contribute to climate change, meaning that improving air quality can also support achievement of Pakistan's international commitment to mitigate climate change.

1.2 Impacts of Air Pollution in Pakistan

Poor air quality has significant environmental, economic/ developmental and environmental impacts in Pakistan. A brief account of these on key sectors is given below:

1.2.1 Health Impacts

The common diseases caused by outdoor air pollution include Acute Respiratory Infection (ARI), heart ailment, lung cancer, chronic bronchitis, and others, while those commonly associated with indoor pollution include ARI, chronic bronchitis, cataracts, tuberculosis, low birth weight, and others. High $PM_{2.5}$ concentrations are linked to respiratory and heart diseases such as ischemic heart disease and can lead to an increased death rate.

It is estimated that 114,000 deaths that had occurred in 2019 in Pakistan could be attributed to $PM_{2.5}$[5], while the average life expectancy has reduced by 2.7 years. Indoor Air Pollution (IAP) has resulted in 55,000 annual deaths due to Acute Lower Respiratory Infections (ALRIs) in Pakistan[6]. Table 1 shows the impacts of air quality on human health.

[3] https://vizhub.healthdata.org/gbd-compare/

[4] WHO EMRO | Environmental health (WB, 2022) https://www.emro.who.int/pdf/pak/programmes/environmental-health.pdf?ua=1

[5] Based on a linear relationship between $PM_{2.5}$ and reduced life expectancy, consistent with findings of EPIC, 2020. https://www.researchgate.net/publication/233848232_Effect_of_Air_Pollution_Control_on_Life_Expectancy_in_the_United_States_An_Analysis_of_545_US_Counties_for_the_Period_from_2000_to_2007

[6] (Pillarisetti, Mehta, & Smith, 2016). https://www.researchgate.net/publication/305546911_HAPIT_the_Household_Air_Pollution_Intervention_Tool_to_Evaluate_the_Health_Benefits_and_Cost-Effectiveness_of_Clean_Cooking_Interventions

Table 1: AQI Categories and Health Breakpoints

AQI	Category	Associated Health Impacts
0-50	Good	Minimal Impact
51-100	Satisfactory	May cause minor breathing discomfort to sensitive people
101-200	Moderate	May cause breathing discomfort to the people with lung disease such as asthma and discomfort to people with heart disease, children and older adults
201-300	Poor	May cause breathing discomfort to people on prolonged exposure and discomfort to people with heart disease with short exposure
301-400	Very Poor	May cause respiratory illness on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases
401-500	Severe	May cause respiratory effects even on healthy people and serious health impacts on people with lung/heart diseases. The health impacts may be experienced even during light physical activity

1.2.2 Economic and Developmental Impacts

The most significant economic impact of air pollution is due to the illnesses caused by it. These can be divided into welfare losses (as people with illnesses need to be hospitalized) and total forgone labor output (people cannot work if they are ill). The World Bank (2016) estimated these losses for Pakistan in 2013 amounted to USD 47,713 million and USD 6,582 million respectively (or 5.88% and 0.81% of the GDP)[7].

Ozone pollution further poses a risk to the food security of Pakistan. A decrease in the overall wheat production would impact the food security. It is estimated that the ozone depletion has reduced crop yield by 34 to 46%[8]. In year 2000, Pakistan has suffered the economic loss amounting to USD 557 million or 0.76% of the GDP[9] in agriculture sector.

1.2.3 Climate Change and Environmental Impacts

The issues of climate change and air pollution are closely linked because (i) in many cases, GHGs and air pollutants are emitted from the same sources, such as residential cooking, industry, electricity generation, transport, agriculture and waste and (ii) some of the substances contribute to climate change and the adverse effects of air pollution, such as methane, black carbon and ground-level ozone, i.e.

[7] https://data.worldbank.org/country/pakistan

[8] Ahmed, S. (2015). Air pollution and its impact on agricultural crops in developing countries – A review. *Journal of Animal and Plant Sciences, 25*.

[9] Van Dingenen, R., Dentener, F. J., Raes, F., Krol, M. C., Emberson, L., & Cofala, J. (2009). The global impact of ozone on agricultural crop yields under current and future air quality legislation. *Atmospheric Environment, 43*(3), 604-618. doi: https://doi.org/10.1016/j.atmosenv.2008.10.033

Short-Lived Climate Pollutants (SLCPs) (International Energy Association (IEA), 2016.

1.3 Policy Rationale and Expected Outcomes

Implementation of NCAP will ensure that the air quality issues in Pakistan are addressed and the associated adverse impacts are minimized including health, economic and developmental and climate change and Environmental impacts. Assuming a growth in the GDP rate of 2.77% per year[10], the GDP of Pakistan can be expected to reach USD 480.11 billion in 20 years. Based on welfare losses at 5.88% of GDP and forgone labor output losses at 0.81% of GDP[11], a health benefit of USD 24.56 billion per annum could be achieved through implementation of the Policy in terms of avoided health impacts. It has been proven through research that an improved national average lifespan of 2 years[12] is expected as the Policy prioritizes reduction of $PM_{2.5}$. Considering a 2% annual growth rate, the policy interventions will have an impact of almost 129,500 reduced annual deaths.

An additional economic benefit of implementation of the NCAP would be improved crop growth rates due to elimination of air pollutants including ozone pollution. Assuming that implementation of the Policy would result in elimination of all pollutant sources evenly[13], and that the presence of ozone is linearly proportional to the crop losses of 0.76% of GDP[14], a total benefit of USD 2.79 billion per annum can be expected in terms of avoided crop losses.

The Policy will bridge the gaps in governance mechanism, coordination, institutional strengthening, building capacity and providing monitoring and compliance framework for air quality both at national and provincial levels. There would also be strategic edge for Pakistan by addressing regional concerns regarding transboundary air pollution.

[10] Based on average GDP growth from 2014 to 2019 (World Bank, n.d.)

[11] It is assumed that these losses provided in PPP would be similar percentages when adjusted for nominal GDP.

[12] Based on a linear relationship between $PM_{2.5}$ and reduced life expectancy, consistent with the findings of (EPIC, 2020)

[13] A reduction of ~75% of $PM_{2.5}$ is required to bring the AQ from 200 to 100, thus it is assumed that implementation of the Plan will result in similar decrease in Ozone concentration for the purpose of this calculation.

[14] Van Dingenen et al. (2009)

2. Alignment with other Policies and Legislation

2.1 Legal Framework and Policy Environment for Air Quality in Pakistan

The concept of "environmental justice" was introduced in the jurisprudence of Pakistan by the Supreme Court in 1994 through its landmark judgment in the case of Shehla Zia (SCP, 1994). Article 9 and 14 of the Constitution of Pakistan (the "Constitution") were interpreted to include the right to a healthier and cleaner environment as part and parcel of '*right to life and dignity of man'*. Succinctly, clean pollution free air is a fundamental right of every citizen guaranteed under the Constitution and additionally protected by the national legislative framework.

2.1.1 National Environmental Policy, 2005

The Policy provided an overarching framework for addressing the environmental issues facing Pakistan including air pollution. The Section 3.2 provides broad guidelines for improving Air Quality and Noise.

2.1.2 Pakistan Environment Protection Act (PEPA), 1997

The National legislative and regulatory framework primarily emanates from the PEPA 1997, which creates, a monitoring/regulatory body the EPA[15], prohibits excessive emissions of air pollutants[16], suggests mechanism for determining the acceptable level of said emissions[17], empowers the federal government to penalise the offending parties[18], prohibits operation of motor vehicles which emit excessive air pollutants[19] and provides for self-monitoring mechanism of emissions by industries called Self-Monitoring, Analysis and Reporting Technology (SMART)[20]. SMART system is based on the polluter pays principle, those who pollute should bear the cost of managing the pollution, it serves a twofold purpose, one discourages emissions and second aids the EPA in collecting data at a lesser cost. It may be noted that the EPA, over the years, has determined acceptable levels of air pollutant emissions by establishing National Environmental Quality Standards (NEQS) under Section-6 of the PEPA, 1997 through various notifications (PEPA, 2010).

Upon promulgation of the 18th Amendment to the Constitution, the subjects of "environment" and "sustainable development" have been devolved on to the provinces. The NCAP aims to provide overarching guidelines and recommendations to improve air quality which may be implemented on a provincial level. However, coordination between the federal government and provinces may be facilitated.

[15] Section 5 of PEPA 1997
[16] S 11 of PEPA 1997
[17] S 6 of PEPA 1997
[18] S 11(2) OF PEPA 1997 and The Pollution Charge for Industry (Calculation and Collection) Rules 2001
[19] S 15 of PEPA 1997
[20] NEQS (Self-Monitoring and Reporting Industry Rules) 2001

2.1.3 The Pakistan Climate Change Act, 2017

To aid the implementation of the existing constitutional guarantees and national legislative framework, various policies have been devised by the relevant line Ministries/Divisions. Most relevant for the purpose of NCAP are mentioned below:

2.1.4 National Climate Change Policy, 2021

a. Air pollution was recognized as an important climate change threat to Pakistan under Section 3(5) "increasing air pollution from agriculture, transport and industry resulting into smog inflicting huge loss to aviation, reduced mobility, loss of lives in accidents due to poor visibility and health hazards".

b. In Section 5 NCCP mentions the policy actions that promotes the mitigation of poor air quality and reduction of emissions. It further recommends policy interventions to reduce GHG emissions in the following sectors-energy, transport, urban planning, waste management, industries, forestry and agriculture. In 2017-18, Pakistan's total GHG emissions were 490 million tons of CO_2 equivalent.

c. Section 7 recommends initiating programmes to create public awareness on issues relevant to climate change including air pollution.

2.1.5 Updated Nationally Determined Contributions (NDC), 2021

Pakistan's updated NDC emphasizes that air pollution and mitigation of SLCP are key components of its climate change commitments. This recognition is operationalized through the identification of specific policies and measures that will achieve air quality benefits alongside SLCP and GHG emission reductions. Pakistan's NDC also identifies actions to increase coordination and alignment between climate change and air quality planning. For example, the NDC explicitly identifies the revision of the Pakistan Clean Air Program as a priority, and states that the Low Emissions Analysis Platform (LEAP) tool will be used to assess the multiple benefits of emission reductions, including benefits for human health through improved air quality.

These measures include:

a. 30% shift to electric passenger vehicles and 50% shift to electric two/three wheelers and buses by 2030
b. Euro-5 standard fuel in petroleum industry introduced and the aim is to steadily increase its market share
c. Switching to zig-zag brick kiln technology
d. Continuation of reduction and elimination of Persistent Organic Pollutants (POP) program, initiated in 2015

2.1.6 National Electric Vehicle (EV) Policy, 2019

The purpose of the Policy is to introduce electric and alternate fuel-based transportation to drastically cut down emissions and mentions that transportation accounted for 43% of airborne emissions. The Policy recommends various incentive schemes for using and manufacturing electric vehicles.

2.1.7 Alternative & Renewable Energy Policy, 2019

The purpose of the Policy was to develop an efficient, sustainable, secure, affordable, competitive and environment friendly power system. Section 1.4 of the Policy promotes different types of projects such as solar, energy from waste, biomass, wind, etc.

2.1.8 Provincial Environment Protection Acts

All the provinces have enacted the Provincial Environmental Protection Acts, which have provisions for dealing with air quality management.

3. The National Clean Air Policy (NCAP)

The National Clean Air Policy (NCAP) aims to provide a framework for improving air quality and has been developed through inputs of stakeholders throughout the country. Stakeholder consultation sessions were conducted in all the provinces of Pakistan including Azad Jammu and Kashmir (AJK) and Gilgit-Baltistan (G-B) with relevant government departments including environmental protection agencies, local government, and planning agencies, members of the civil society, experts from academia, and representatives of the private sector. The consultations focused on soliciting feedback on the policy actions and define roles and responsibilities to improve air quality.

The NCAP is a national document, and therefore focuses on actions at the national scale that can achieve improvements in air quality across Pakistan. However, the provinces of Pakistan have a crucial role in implementing actions to improve air quality within their areas of responsibility. The air pollution sources and mitigation actions in each province necessary to improve air quality may differ. Therefore, each province will follow an internal planning and consultation process to adjust priorities and to define specific actions and measures that will work best in the provincial and local context. The NCAP does not intend to replace ongoing initiatives by the provinces to improve air quality, but instead supplement those initiatives and allow cooperation with other provinces, experts, and stakeholders to formulate more coherent strategies and actions plans.

The first National Air Pollutant Emission Inventory for Pakistan was developed in 2022 by the Ministry of Climate Change (MoCC) with the support from development partners. An emission inventory is a key air quality management tool, as it estimates the magnitude of emissions from all major source sectors. The results of Pakistan's First National Air Pollutant Emission Inventory show the following five high polluting sectors in order of listing that cause significant contribution to air pollution:

a. Transport

b. Industry

c. Agricultural waste/Biomass

d. Solid Waste

e. Residential/Building sectors

3.1 Policy Goal

The goal of NCAP is *"to improve air quality in the country through implementation of various policy, technological, and management actions including monitoring of the air quality"*.

3.2 Policy Objectives

The NCAP includes four policy objectives that, taken together, can allow key institutions at national and provincial levels to understand the air quality status, and identify, evaluate, implement and monitor mitigation actions to reduce emissions. These objectives include:

a. **Data Collection and Baseline:** NCAP promotes regular generation and compilation of scientific data to establish the baseline and ensure effective monitoring of the policy implementation.

b. **Establishing Air Quality Targets:** NCAP outlines air quality targets, based on NEQS and Provincial Environmental Quality Standards (PEQS), and consistent with WHO's Air Quality Guideline Interim Targets, 2021.

c. **Identifying Key Mitigation Actions:** NCAP identifies key specific, concrete mitigation actions that can be taken forward and implemented in order to target the major sources of air pollutant emissions.

d. **Outlining Implementation Framework:** NCAP outlines a framework by which the air quality management will effectively be coordinated, to ensure that the mitigation actions are implemented, and air quality targets are monitored and achieved.

3.3 Prioritization of Air Quality Targets

The definition of multiple Air Quality Targets focusing on different health-damaging air pollutants and covering short, medium and long-term periods ensures a comprehensive approach to improving air quality. In practice resources and capacity is constrained at Federal and Provincial levels in pursuing these Air Quality Targets, meaning that there is a need to prioritize the targets based on following outlines:

a. **Focus on Actions that contribute to multiple Air Quality Targets:** To achieve the Air Quality Targets, it is required that mitigation actions are implemented which reduce air pollutant emissions from major sources. Many of these actions can simultaneously reduce emissions of multiple air pollutants, and therefore reduce concentrations of multiple air pollutants for which Air Quality Targets have been defined. The identification of those actions that reduce air pollutant emissions and can contribute to achieving multiple Air Quality targets should be prioritized.

b. **Prioritize achievement of $PM_{2.5}$ Air Quality Targets:** In comparison to other air pollutants, $PM_{2.5}$ has the largest disease burden and impact on human health. Therefore, achievement of the $PM_{2.5}$ Air Quality Targets could have the biggest impact on improving public health compared to the other Air Quality Targets across Pakistan. As mitigation actions are identified and evaluated, the impact of those actions on reducing $PM_{2.5}$ concentrations should be prioritized.

c. **Prioritize achievement of long-term exposure Air Quality Targets:** In comparison to short-term exposure to air pollution, long-term, chronic exposure has a substantially larger impact on human health. Therefore, priority should be given to achieving the long-term Air Quality Targets, in comparison to the short-term targets. Mitigation actions should therefore be identified which reduce air pollutant emissions that contribute most to annual concentrations of specific pollutants. In many cases, the actions which reduce emissions across the year will also reduce short-term peaks in air pollutant emissions.

Table 2: Ambient Air Quality Targets

Pollutant	Frequency	Target
$PM_{2.5}$	Annual average	35 µg m^{-3}
$PM_{2.5}$	24 hour	75 µg m^{-3}
PM_{10}	Annual	70 µg m^{-3}
PM_{10}	24-hour	150 µg m^{-3}
Ozone (O_3)	Average daily maximum 8-h concentration over highest 6-month period	100 µg m^{-3}
Ozone (O_3)	Daily maximum 8-hour	160 µg m^{-3}
Nitrogen dioxide (NO_2)	Annual	40 µg m^{-3}
Nitrogen dioxide (NO_2)	24-hour	120 µg m^{-3}
Sulphur dioxide (SO_2)	24-hour	125 µg m^{-3}
Carbon monoxide (CO)	24-hour	7000 µg m^{-3}

4. Policy Recommendations

Reduction of air pollution presents a complex set of challenges in view of the nature of the problem. The mitigation actions for improving air quality requires a consideration for economic costs involved, the institutional, social, and cultural barriers in implementation. For sectoral integration, the Policy recommendations are made across different sectors which are already covered by various other policies (like NCCP 2021, EV Policy 2022, Alternative & Renewable Energy Policy 2019 etc.) along with additional policy measures.

4.1 Sectoral Recommendations

4.1.1 Fuel Standards

a. Implement fuel quality standards in transport to comply with Euro-5 or Euro-6 leading to complete shift to minimum Euro-5 by 2025, or Euro-6 by 2030

b. Explore and implement financial support measures to regulate and control the prices of Euro-5 compliant vehicles. Identify incentives or subsidies to encourage refineries for ultimate transition to Euro-6 compliant fuels

4.1.2 Transport

a. Improved measures to ensure inspection of vehicles for compliance with NEQS/PEQS, through enforcement. Such measures to include; capacity building of Motor Vehicle Examiners (MVEs). Tools like digital maintenance of emission data needs to be introduced for compliance/non-compliance of vehicles to regulate movement in identified areas

b. Introduce mechanisms for regulation on non-compliant vehicles, such as emission taxation or penalties

c. Introduce plan for gradual phasing out of obsolete technology in engines

d. Further development and improvement of mass transit systems (multi-modal transport model) to at least 10 major cities by 2030, to reduce reliance on personal vehicles and develop plan for expanding such systems to other cities.

e. Expedite the market penetration of EV's in Pakistan through legal mandates, subsidies, and investment in related infrastructure. Phased modernization of public fleet towards EV technology

f. Promote low carbon, fuel efficient infrastructure and technology within railways, maritime, aviation and development of clear road map that promote the use of freight services

g. Introduce mechanism for zoning on the basis of AQI to regulate traffic movement

h. Strengthen regulatory control for traffic management (focusing on big cities), through measures like strengthening of parking facilities, introduction of mechanism for imposing taxation to discourage motorized transport

4.1.3 Urban Planning and Management

a. Promote urban greening, through measures like urban forestry, management of green spaces/parks, etc.

b. Promote non-motorized mobility, through development and management of infrastructure like removal of encroachments, development of micro infrastructure, while ensuring gender considerations

c. Implement measures to reduce dispersion of particulate matter/dust, specially from construction sites/roadsides

d. Promote adoption of green building codes to reduce the indoor air pollution and ensure energy efficiency. Encourage use of environmentally friendly materials in construction to reduce reliance on conventional materials

e. Improve land-use planning to ensure dedicated space is available for housing and discourage creation of housing societies near industrial areas

4.1.4 Industrial Sector

a. Revision of existing industrial emission standards, where necessary, and the establishment of sectoral industrial emission standards to address and mitigate emissions of air pollutants specific to each industry type

b. Strengthen regulatory measures to ensure compliance with NEQS/PEQS, with priority focus on high impact industry and conduction of third party audits

c. Restriction on establishment of new industries within cities by establishing industrial sites outside cities

d. Gradual upgradation of industries towards low-emission technologies, like upgradation of all brick kilns to zigzag by 2025

e. Impose immediate and complete ban on high polluting industries like pyrolysis of tires, burning of coal in traditional furnaces, etc., and practices like elimination of Hydro-Flouro Carbon (HFC) emissions from contained and emissive application and elimination of gas flaring in oil and gas sector

f. Develop standards for diesel power generation sets below 800 Kilo Watt (KW) category. For already operational diesel generation sets, ensure usage of either of the two options:(a) use of retrofitted emission control equipment having a minimum specified PM capturing efficiency of at least 70%, type approved by one of the accredited labs; or (b) shifting to gas-based generators by employing new gas-based generators or retrofitting the existing diesel generation sets for partial gas usage

4.1.5 Agriculture, Forestry and Land-Use

a. Impose immediate and complete ban on burning of crop residues, and introduction of low-cost alternative options for agriculture waste management. Promotion of circular economy in agriculture waste management

b. Enhanced public-private partnerships and adopt and upscale available solutions for agriculture systems, like utilizing engineering controls to control particulate matter generation from tilling and threshing during crop harvesting

c. Introduce and upscale measures to reduce emissions from livestock sector

d. Strengthen measures for management of forest fires, including effective preparedness, avoidance and immediate control of incidents

4.1.6 Waste

a. Impose immediate and complete ban on open burning of solid waste across Pakistan

b. Introduction of Integrated Waste Management System (IWMS) in 10 cities by 2025 and development of scientifically designed and managed landfill sites in 5 cities by 2025 and up to 10 cities by 2030

c. Develop at least 2 models for waste to energy by 2025, upscaling to 10 cities of Pakistan by 2030, through clear guidance on power tariffs, tipping fees that facilitates introduction of waste-to energy technologies in Pakistan

4.1.7 Energy

a. Introduce and promote measures to reduce indoor air pollution like, improved cookstoves, provision of alternate domestic fuels like Liquid Petroleum Gas (LPG) and renewable energy sources to reduce exposure to pollutants

b. Introduce de-carbonization framework for power sector towards carbon neutrality targets

4.1.8 Strengthening Clean Air Diplomacy

a. Establishment of effective regional coordination mechanism to take up matters related to transboundary air pollution in accordance with international agreements/treaties under the lead of Ministry of Climate Change

b. Strengthen research and planning, through initiating joint air pollution modelling activities in regional context

4.1.9 Enabling Environment

a. Establish institutional arrangements for effective coordination and implementation of NCAP which further facilitates enhanced implementation and devising Clean Air Action Plans

b. Promote ways and means of effective communication channels to enhance the outreach of information to public and private sector key stakeholders including communities

c. Strengthening research on priority aspects related to air pollution for facilitating informed decision for policy and strategy. Preparation of Air Pollutants & SLCP Inventory for Pakistan

d. Targeted training programs for monitoring, compliance/regulatory control, advocacy and knowledge management for clean air in Pakistan

4.2 Impact of Five Priority Interventions on Air Pollution in Pakistan

The National Clean Air Policy has identified one priority intervention in each of the five sectors with the aim of accelerating progress to reduce air pollutant emissions across all major air pollution emission sources. The five priority interventions are:

The Pakistan Clean Air Policy has identified one priority intervention in each of the five major air pollutant-emitting sectors with the aim of accelerating progress to reduce air pollutant emissions across all major air pollution emission sources. The five priority interventions are:

a. **Households: Promoting Use of Low Emission Cooking Technologies.** Switching to improved efficiency biomass cookstoves, and cleaner fuels like LPG and electricity for cooking can reduce emissions from the household sector. Implementing this intervention has a double benefit. It reduces the emissions of air pollutants and indoor and outdoor exposure.

b. **Transport: Implement Euro-5 and Euro-6 Fuel Quality Standards.** This intervention reduces the sulphur and other pollutants in fuel which reduces air pollution.

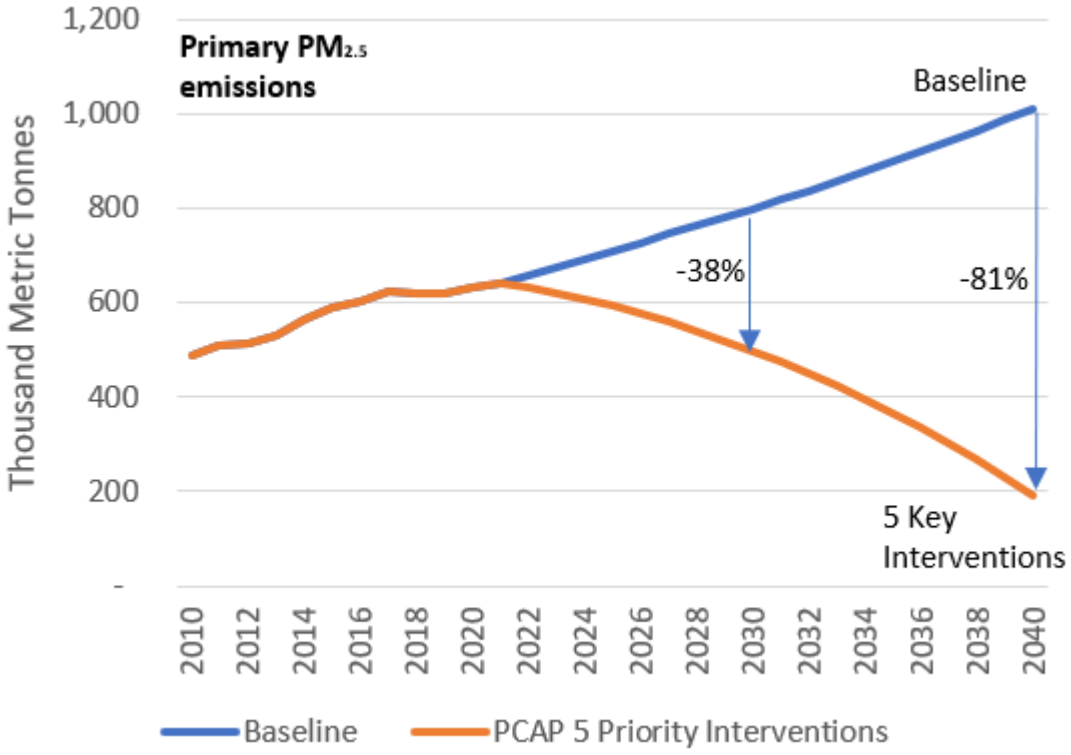
c. **Industry: Enforce emission standards for industries.** This intervention requires that industries comply with emission standards that control the emission of key air pollutants such as particulate matter through the mandatory fitting of particulate filters to high-polluting machinery.

d. **Waste: Prevent open burning of Municipal Solid Waste.** This intervention applies at landfill sites which require best practices of land fill management to reduce the chances of fires breaking out at existing landfill sites.

e. **Agriculture: Preventing burning of Agricultural Residue.** This intervention promotes alternative uses of agricultural residue (for animal feed, for fuel) or their reincorporation into the soil.

The implementation of these five priority interventions is expected to make a substantial contribution to improving air quality across Pakistan. The scientific estimate of SLCP inventory accounts that the below mentioned high-priority actions is expected to reduce $PM_{2.5}$ emissions by 38% in 2030 compared to the baseline scenario, and by 21% compared to 2020 levels. By 2040, these five key interventions can achieve even larger emission reductions, reducing emissions by 81% in 2040 compared to the baseline scenario and by 70% compared to 2020 levels.

Figure 2: Cumulative impact of five priority interventions of NCAP on national total $PM_{2.5}$ emissions between 2020 and 2040



5. Policy Implementation Mechanism

Following the adoption of NCAP, the Federal Government shall assist the provinces to develop their Implementation Plans. All relevant ministries, departments and agencies shall devise plans and programs to implement the policy provisions relating to their respective sectors/sub-sectors. Similarly, the provincial governments, AJK, G-B and local governments shall also devise their own strategies, plans and programs for implementation of the Policy.

5.1 Governance Mechanism

To ensure effective policy implementation and to oversee progress in this regard, a **National Action Committee** shall be established at the federal level, which shall be facilitated by a Technical Committee.

The National Action Committee will provide policy guidance and review progress. The Committee shall regularly review and update the NCAP every five-years. The Technical Committee will be responsible to oversee implementation of the Policy and relevant plans. The Technical Committee will report back to National Action Committee.

The composition of the committees shall be as under:

5.1.1 Composition of National Action Committee

1.	Federal Minister for Climate Change	Chair
2.	Secretaries of Ministries including: Climate Change, Planning Development & Special Initiatives, Science and Technology, Industries and Production, Finance, Energy/ Power Division, Petroleum Division & Natural Resources, Food Security & Research, National Health Services, Regulations and Coordination, Foreign Affairs	Members
3.	Chief Environment, Planning Development & Special Initiatives	Member
4.	Director Generals of Federal and Provincial Environmental Protection Agencies (EPAs) including AJK and G-B	Members
5.	Secretaries of Provincial Environment Departments including AJK and G-B	Member
6.	Chief Secretaries Provincial Planning and Development Departments including AJK and G-B	Members
7.	Director General (Climate Change/Environment), Ministry of Climate Change	Member/ Secretary
8.	Heads of Director General, Pakistan Meteorological Department (PMD)/Executive Director, Global Change Impact Studies Centre (GCISC)/Managing Director, National Energy Efficiency & Conservation Authority (NEECA)/ Chief Executive Officer, Alternative Energy Development Board (AEDB)/Chairman, Capital Development Authority (CDA)/Chairman, Space & Upper Atmosphere Research Commission (SUPARCO)	Members

5.1.2 Composition of Technical Committee

1.	Additional Secretary, Ministry of Climate Change	Chair
2.	Director General, Pakistan Environmental Protection Agency	Member
3.	Member Infrastructure Planning Commission/Additional Chief Secretaries Provincial Planning and Development Departments	Member
4.	Provincial Environmental Protection Agencies (EPAs) of including AJK and G-B	Members
5.	Secretaries Environment/Agriculture/Forest/ Health/Energy/Planning & Development/ Local Government/ Public Health Departments;	Members
6.	Three representatives from the corporate sector/Chambers of Commerce and Industries and civil society organizations	Members
7.	Three eminent experts from the field academia	Members

5.2 Roles and Responsibilities

The NCAP will be supplemented by a national level Implementation Plan which will be rolled out with in one year of the approval of the Policy. It shall clearly articulate the program of activities to implement NCAP. The Plan shall also set the targets for strengthening air quality standards as well as the roles and responsibilities of different entities. The provincial governments will develop the Provincial Clean Air Action Plans through their respective Environment departments.

For policy implementation, key institutions relevant for the implementation of priority mitigation actions shall be identified in the Implementation Plan/s wherein institutional responsibilities will be broadly placed in three categories:

a. **Policy, Planning and Regulation:** Signifying key institutions for policy making, defining standards and regulations, and planning institutional arrangements, capacity building and research initiatives important for the completion of a particular action

b. **Management and Implementation:** Institutions with mandate to facilitate and oversee implementation and management of mitigation measures

c. **Enforcement:** Signifying institutions mandated to enforce policies, standards and regulations for a given a mitigation measures

Envisaged Institutional Roles and Responsibilities for Implementation of Priority Policy Recommendations is placed at “Annex-I”.

MoCC shall take the responsibility to facilitate in providing policy guidance, coordination and enabling environment for roll out of NCAP. The MoCC shall coordinate national and international transboundary air pollution issues and ensure their compliance with international commitments. Furthermore, MoCC shall support research on environmental issues related to air pollution and its co-benefits for climate change mitigation. The relevant federal and provincial Ministries and line departments would take up the responsibility of implementing the relevant sectoral policy recommendations.

The Pakistan Environmental Protection Council (PEPC) shall oversee the implementation of the NCAP on the progress report submitted by MoCC. In parallel provincial Environmental Protection Councils shall ensure provincial implementation of the NCAP and related provincial action plans. The responsibility for monitoring, control and mitigation of air pollution is devolved to the provinces under the 18th Constitutional Amendment. Thus, the federal and provincial EPAs shall review and update NEQS/PEQS and set the NCAP monitoring targets. The EPAs shall devise the targets in accordance with WHO's Guidelines.

5.3 Stakeholders Engagement

Implementation of the NCAP will require active participation from the stakeholders that includes public sector institutional, research bodies, civil society and media/advocacy groups. Options shall be explored for engaging the private sector through Public Private Partnership (PPP) in areas that require high investment and technical and management expertise, such as the mass transit systems and solid waste management, etc. Initiatives under the Corporate Social Responsibility (CSR) will be encouraged to implement policy necessary measures.

5.4 Resource Mobilization

The implementations of the Policy would require allocation of public sector funds. The private sector will have a major role to play in shifting to technologies and upgrades that result in lower emission of pollutants. In addition, some of the most high impact measures, such as the introduction of electric vehicles, or upgrading fuel standards will be implemented by the private sector and will be driven primarily by fiscal and tax incentives.

In this regard, MoCC shall coordinate with international donor agencies to access funds for implementation of NCAP at the federal and provincial levels. Opportunities under the various climate finance windows along with generating additional resources from market-based mitigation instruments shall be explored.

5.5 Communication and Outreach

Providing information and guidance to the public on environmental matters, such as air pollution, is entrenched in Pakistan's federal and provincial environmental laws, and shall be a cornerstone of NCAP's communication. Governmental organizations at all levels shall devise appropriate strategies to share information in a harmonized manner. Ultimately, improved knowledge among the general public about positive health impacts of clean air will increase public support for NCAP and its Implementation Plans.

Public sector institutions involved in air quality management shall communicate air quality data to the general public. Public outreach shall be ensured through media.

Citizens and stakeholders would also be sensitized about individual and collective actions that prevent air pollution. Industries can be encouraged to voluntarily report air quality data to the public, thus showing leadership and encouraging other industries to commit to reducing air pollution from their operations.

5.6 Reporting, Periodic Review and Updation of NCAP

This Policy document shall be reviewed every 5 years, based on National Air Pollutant Emissions Inventory and accordingly, the Implementation Plans shall also be updated. The Air Pollutant Emission Inventory shall be updated every year. The MoCC shall host an annual National Clean Air Conference (NCAC).

6. Annexures

Annex-I

Envisaged Institutional Roles and Responsibilities for Implementation of Priority Policy Recommendations

Policy Measures	Key Stakeholders
Mass Transit	a. Ministry of Communications b. Ministry of Railways c. Ministry of Maritime Affairs d. Ministry of Aviation e. Provincial Transport Departments f. Communication and Works Departments (CWD) g. Local Governments
Electric Vehicles	a. Ministry of Finance b. Ministry of Industries and Production c. Ministry of Climate Change d. Engineering Development Board e. National Energy Efficiency & Conservation Authority (NEECA), f. Alternate Energy Development Board (AEDB) g. Provincial Transport Departments h. Private Sector
Improved Vehicle Inspection and Maintenance	a. Pakistan Environment Protection Council b. Provincial Transport Departments c. Excise and taxation Offices (ETOs)/Motor Vehicle Examiners (MVEs) d. Traffic Police
Emission Control in Industry	a. Pakistan Environment Protection Council b. Ministry of Climate Change c. Ministry of Industries and Production d. Provincial EPAs e. Provincial Industries Departments f. Police
Upgrading Fuel Quality Standards	a. Pakistan Environment Protection Council b. Ministry of Energy, Petroleum Division c. Oil and Gas Regulatory Authority d. Oil and Gas Regulatory Authority with support from Oil Companies

Policy Measures	Key Stakeholders
	e. Advisory Committee
Prohibition of Open Waste Burning	a. Local Governments b. Waste management companies c. Capital Development Authority (CDA) d. Municipal Corporations; Town Councils; Village Organizations e. District Administration/Police
Prohibition of Crop and Agricultural Waste Burning	a. Federal/Provincial EPAs b. Provincial Agriculture Departments c. Local Governments d. District Administration/Police
Upgrading of Brick Kiln Technology	a. National Energy Efficiency & Conservation Authority b. Federal/Provincial EPAs c. Provincial Industries Departments d. Private Sector

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