JOBS FOR CLEAN AIR

National Programme for Capacity Development for Air Quality Management

NKN

SCGJ
SKILL COUNCIL FOR GREEN JOBS

iFOREST
INTERNATIONAL FORUM FOR ENVIRONMENT, SUSTAINABILITY & TECHNOLOGY

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September 2022

ISBN: 978-81-949354-2-1

Acknowledgement

The team would like to acknowledge the Pollution Management and Environmental Health (PMEH) multi-donor trust fund for the financial support for this study.

We are grateful to the following people for their valuable inputs during the development of this report:

- World Bank Group: Karin Shepardson, Gary Kleiman, Sayantan Sarkar and Sharlene J Chichgar
- National Knowledge Network: Ajay Deshpande, B. Padma S. Rao and S. Gunthe
- Skill Council for Green Jobs: Praveen Saxena, Deepak Rai, Sarvesh Mall and Arpit Sharma

We are grateful to Amandeep Dubey, Anil Gupta, Arunesh Karkun, Ashish Gupta, Bhargav Krishna, Bhola Ram Gurjar, Chandra Venkataraman, Gufran Beig, J. S. Kamyotra, Karan Madan, Moqtik Bawase, P. Dhamija, Pratima Singh, Radha Goyal, Ronak Sutaria, S. N. Tripathi, P.K Gupta, Sakshi Batra, Sanjeev K. Kanchan, Sharad Gokhale, Sundeep Singh, Tanushree Ganguly and Vijay Kumar Soni for actively participating in the expert consultation workshop held in Delhi on 28-29 March 2022, and providing valuable insights on the job roles and capacity development needs in the AQM sector. Their affiliations are in Annexure 7.

We acknowledge the contribution of Veerendra Sahu, IIT-Kanpur, Anurag Swarnkar, IIT-Roorkee, Akshay Nayak, IIT-Roorkee, Srishti Jha, iFOREST and Rahul Kumar, iFOREST in conducting the training needs assessment and stakeholder consultation.

Citation: Chandra Bhushan and Arpo Mukherjee 2022, *Jobs for Clean Air, National Programme for Capacity Development for Air Quality Management*, iFOREST, New Delhi.

Published by: International Forum for Environment, Sustainability & Technology (iFOREST), Himalaya House, I – 89, 8th Floor, 23 Kasturba Gandhi Marg, New Delhi – 110001

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List of Acronyms

AAQ	Ambient Air Quality
ADB	Asian Development Bank
AIIMS	All India Institute of Medical Sciences
APCD	Air Pollution Control Device
AQM	Air Quality Management
ARAI	Automotive Research Association of India
B.VOC	Bachelor of Vocation
C&D	Construction and Demolition
CAAQMS	Continuous Ambient Air Quality Monitoring System
CEMS	Continuous Emission Monitoring System
CPCB	Central Pollution Control Board
CSE	Centre for Science and Environment
CSIR	Council of Scientific and Industrial Research
CTM	Chemical Transport Modelling
EI	Environmental Intelligence
GIS	Geographic Information System
GRAP	Graded Response Action Plan
GSDP	Green Skill Development Programme
iFOREST	International Forum for Environment, Sustainability & Technology
IIT	Indian Institute of Technology
IoR	Institute of Repute
ITI	Industrial Training Institute
JNTUH	Jawaharlal Nehru Technological University, Hyderabad
LEZ	Low Emmision Zone
LPG	Liquefied Petroleum Gas
M.VOC	Master of Vocation
MNRE	Ministry of New and Renewable Energy
MOEF&CC	Ministry of Environment, Forest and Climate Change
MOPNG	Ministry of Petroleum and Natural Gas
MOHUA	Ministry of Housing and Urban Affairs
MSDE	Ministry of Skill Development and Entrepreneurship
NCAP	National Clean Air Programme
NEERI	National Environmental Engineering Research Institute
NGO	Non-Governmental Organization
NGT	National Green Tribunal
NKN	National Knowledge Network
NMCA	National Mission for Clean Air
NOS	National Occupational Standards
NSQF	National Skills Qualifications Framework
O&M	Operation and Management
PDS	Public Distribution System
PIL	Public Interest Litigations
PUC	Pollution Under Control
QA/QC	Quality Assurance/Quality Control
QP	Qualification Pack
RPL	Recognition of Prior Learning
RWAs	Resident Welfare Associations
SA	Source Apportionment
SCGJ	Skill Council for Green Jobs
SOP	Standard Operating Procedure
SPCB	State Pollution Control Board
SSC	Sector Skill Council
TERI	The Energy and Resources Institute
TNA	Training Needs Assessment
TPA	Third Party Assessment
ULB	Urban Local Body
USEPA	United States Environmental Protection Agency

Definitions

Air polluting industry: This comprises industrial units and mines regulated under the Air (Prevention and Control of Pollution) Act, 1981.

Air pollution monitoring and control industry: These industries participate in the manufacturing, erecting, supplying/vending, operating, and servicing of air pollution monitoring devices and control equipment.

Employee: A person employed for wages or salary.

Institutes of Repute: IoRs are academic institutes, research organizations, NGOs, and think tanks that are supporting cities under the National Clean Air Programme.

Job: A job means a task or a piece of work. An employee can do multiple jobs. So, the number of jobs is not the same as the number of employees.

Job factor: Number of jobs at various job roles required in different organizations/institutions to meet the goals of NCAP/NMCA.

Job role: A job role means the key responsibility of a job profile or job position. It is a part played by an employee as per his/her key responsibilities. An employee can have multiple job roles. Similarly, in an organization, there can be more than one person to perform a job role.

National Skills Qualifications Framework: NSQF is a nationally integrated education and competency-based framework that enables persons to acquire desired competency levels. NSQF organizes qualifications according to a series of levels of knowledge, skills, and aptitude. These levels, graded from one to ten, are defined in terms of the learning outcomes which the learner must possess.

Executive Summary

To deal with the air pollution challenges across India, the Ministry of Environment, Forest and Climate Change (MoEF&CC) has launched the National Clean Air Programme (NCAP). The NCAP is a long-term, time-bound, national-level strategy to achieve a target of 20 to 30 per cent reduction in Particulate Matter (PM) concentrations by 2024, keeping 2017 as the base year.

The Government of India is also in the process of launching a National Mission for Clean Air (NMCA) to adopt preventative measures that will tackle various contributors to air pollution and converge efforts at the city, state, and national levels by involving various departments and ministries. One of the key objectives of the NMCA is capacity building for various stakeholders in the sector, including State Pollution Control Boards (SPCBs)/Pollution Control Committees (PCC) and Urban Local Bodies (ULBs).

The National Knowledge Network (NKN) is an advisory body, under the aegis of the NCAP, to create adequate capacity in cities and states/UTs to implement present and future air quality management (AQM) efforts and support the implementation of the NCAP/NMCA. Members of the network include leading IITs, national laboratories, think tanks, and NGOs.[1] NKN has been tasked with building technical capacities of Institutes of Repute (IoRs), which are local technical institutions attached to 132 non-attainment cities. It is also mandated to provide knowledge and operational support to ULBs, SPCBs/PCCs, and the Central Pollution Control Board (CPCB). Capacity building is, therefore, a core objective of the NKN.

The World Bank Group is supporting a Technical Assistance (TA) programme on AQM for the Government of India, for a period of three years (2019-2022). The TA was funded by the Pollution Management and Environmental Health (PMEH) multi-donor trust fund. The programme is supporting national, regional, state, and local institutions in strengthening their capacity to achieve pollution reduction targets of NCAP while introducing tools and approaches to integrate an airshed management approach. Under this TA, a study on the "Learning Needs Assessment of Air Quality Management in India" was also commissioned to analyze and distil the existing course curriculum, trainings available in India, and major courses offered globally on AQM.

In light of the need for capacity development to successfully implement the NCAP/NMCA, NKN and the World Bank Group have come together to design recommendations for a National Programme for Capacity Development for Air Quality Management. The International Forum for Environment, Sustainability and Technology (iFOREST), which is a part of the NKN, was assigned the responsibility to lead the development of the proposed National Programme.

I. Approach

The proposed National Programme for Capacity Development for Air Quality Management has been developed using a sevenfold approach that included:

1. Assessment of current training and capacity-building initiatives in AQM and mapping of key institutions/organizations providing these training programmes.
2. Conducting a Training Needs Assessment (TNA) on an *'Awareness-Relevance-Requirement'* matrix. Close to 300 experts participated in the TNA.
3. Development of a skill gap report for the AQM sector that maps relevant organizations/industries, details the job roles, their National Skills Qualifications Framework (NSQF) level, required technical and professional knowledge, and the estimated number of jobs that need training in the sector. This was done through a two-day expert workshop involving more than 40 AQM sector experts and skill sector experts.
4. Mapping of job roles with the NSQF levels.
5. Identification of training types, development of learning goals, and course topics for all job roles.
6. Assessment and identification of training development and delivery institutions.
7. Development of a rollout strategy, including the number and prioritization of trainings and trainees, fund requirements, and funding sources.

The proposed National Programme has been aligned with the requirements set under NSQF to build synergy between capacity development and jobs.

II. Key findings

1. Current capacity development landscape

Considering the vastness of air pollution as a subject, there is only a limited variety of courses currently available in India. In a sample of 96 training courses analyzed to understand the variety of trainings available, a quarter pertains to basic induction courses on managing air quality. This is followed by specialized technical training in air pollution modelling and forecasting (16 per cent), and monitoring techniques (14 per cent). Most of the courses target a general and broad base of trainees. More than two-thirds of these courses are being delivered by international institutions and multilateral organizations.

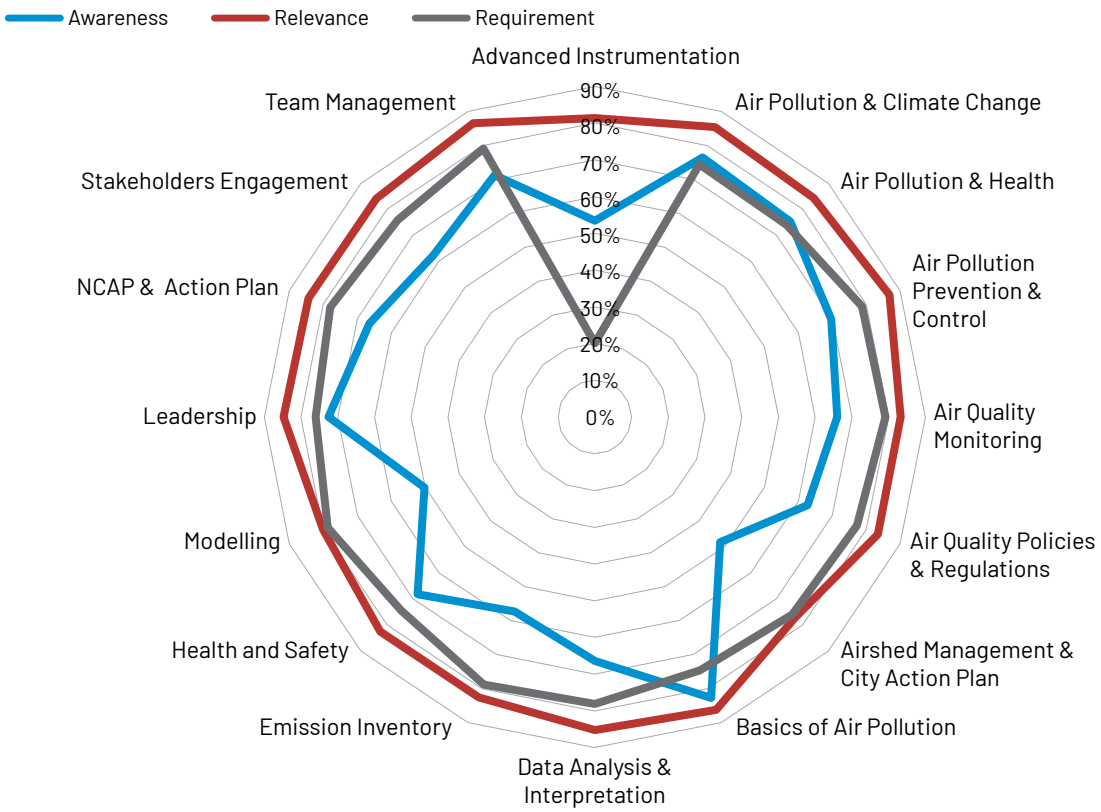
The capacity of Indian organizations to develop and deliver courses is limited in many areas. For example, there are no national institutions/organizations that have developed training courses on managing air pollution from area sources or on the economic aspects of AQM. Similarly, a limited number of institutions have competencies in sectors such as mobile sources, health, air quality planning, and policy and regulation.

2. Training Needs Assessment

The TNA conducted on the 'Awareness-Relevance-Requirement' matrix, with inputs from 288 experts representing various types of organizations, indicates the following:

- **Awareness:** There is a wide variation in the awareness level of experts across the identified topics. Overall, the awareness is high for general topics such as the basics of air pollution, air pollution and climate change etc. The lowest awareness is recorded for technical topics such as airshed management, modelling, advanced instrumentation for monitoring, emission inventory etc.
- **Relevance:** Experts from all the categories identified all topics listed in the needs assessment survey as relevant.
- **Training requirement:** Experts identified a high training requirement in all topics, except for advanced instrumentation for monitoring, which is a specialized skill required in a limited set of job roles like in laboratories. Overall, training demand is high in AQM.

Figure 1: TNA results for the AQM sector



3. AQM sector

There are 17 types of organizations that have the most important role to play in the AQM sector and have the greatest number of present and potential future jobs to offer. These include:

i. Ministry of Environment, Forest & Climate Change
ii. Other central government ministries related to AQM
iii. Department of Environment under the state governments and union territories
iv. Other departments related to AQM under the state governments and union territories
v. Central Pollution Control Board
vi. State pollution control boards and pollution control committees
vii. Urban local bodies
viii. Institutes of repute under NKN
ix. Other academic and research institutes
x. NGOs/Think tanks
xi. Consultants/Consulting firms
xii. Air polluting industries and mines
xiii. Air pollution monitoring and control industry
xiv. Government/Private laboratories
xv. Media
xvi. Financial & economic institutes
xvii. Health agencies/institutes

There are at least 2,80,233 organizations and industries under these 17 types of organizations. A majority of them are air polluting industries, followed by air pollution monitoring and control industry (mostly Pollution Under Control centres for monitoring tailpipe emissions from automobiles), and ULBs.

4. Jobs and training requirements

The jobs in the AQM sector can be divided into direct jobs and indirect jobs.

Direct jobs refer to all jobs that primarily work in planning, organizing, monitoring, mitigating, and/or controlling air pollutants. These jobs are performed by a dedicated workforce that can demonstrate their contribution to the AQM sector. Examples of such jobs include pollution regulators, Pollution Under Control (PUC) inspectors, manufacturers and operators of air pollution monitoring and control equipment, environment managers in industries, policymakers of the environment ministry, scientists working on pollution monitoring, experts and researchers working on air quality management, etc. These jobs are majorly available with central and state pollution control boards, academic and research institutions, NGOs and think tanks, consulting firms, laboratories, air polluting industries, and air pollution monitoring and control industries.

Indirect jobs refer to all jobs that indirectly contribute towards mitigating and/or controlling air pollutants. These jobs are performed by a workforce that supports the direct jobs or provides alternatives to the existing sources of pollution. Examples of such jobs include manufacturers and distributors of clean cooking stoves, mechanical sweeper operators, horticulturists, urban planners, waste management experts, clean energy experts, transport planners, boiler inspectors, and occupational health and safety experts, etc. In India, these jobs are majorly available with ULBs, regulatory authorities related to industry, labour, land, forest etc., various policymaking authorities, academic and research institutions, consulting firms, NGOs, industries providing alternatives, and other related industries.

The total number of jobs required to adequately service the implementation of NCAP/NMCA is estimated to be 2.02 million. A large majority of these jobs are indirect jobs (1.55 million); direct jobs are about 0.47 million. The NSQF level of these jobs ranges from level two to level eight.

About 1.55 million of the total jobs, mostly indirect, are in ULBs. The second-largest number of jobs are in air polluting industries (3,76,000) and air pollution monitoring and control industry (about 57,000). The number of jobs in Central government ministries, state government departments, and pollution control boards amounts to about 10,000.

Most of the indirect jobs already exist like the municipal workers who are engaged in garbage management, road sweeping, plantation and maintenance of green spaces. But these workers have never been trained in their role in managing air pollution in cities. Similarly, some direct jobs like that of the PUC operator already exist, but no formal training has been provided to them.

But there are a large number of jobs, mostly direct jobs, that do not exist currently such as in ministries, departments, pollution control boards, research institutions, and consultancy firms. Similarly, a large number of new jobs will be required in the industries and mines.

So, the challenge in the AQM sector in India is that the people working in indirect jobs have not been trained and a large number of direct jobs that are required do not exist.

5. Key areas for capacity development

AQM sector in India requires capacity development in 11 sub-sectors/areas. These include:

i. Air quality management – General
ii. Air quality planning
iii. Policy and regulation
iv. Inventory, modelling, and forecasting
v. Health
vi. Economic/Finance
vii. Audit, inspection, and enforcement
viii. Ambient air quality monitoring
ix. Air pollution monitoring and control – Area source
x. Air pollution monitoring and control – Mobile source
xi. Air pollution monitoring and control – Stationary source

There are 42 job roles in these 11 sub-sectors. Five of these job roles are indirect and 37 are direct. Many of these job roles do not exist currently but will be required to meet the goals of the NCAP/NMCA. The maximum number of job roles are in air pollution monitoring and control – stationary source (ten job roles). This is followed by air quality management – general and air pollution monitoring and control – mobile source, with six job roles each.

6. Types of training

To building capacity in the AQM sector, six types of training programmes will be necessary:

- Bridge course;
- Advanced course on the subject;
- Short-term tailored training programme;
- Short-term NSQF aligned training programme;
- NSQF aligned courses; and,
- Recognition of Prior Learning (RPL).

The number of different types of training required for the 42 job roles is given below.

Table 1: Course types and number of courses

S.no	Course type	NSQF Level	Number of Courses
1	Bridge course	8	1
2	Advanced Course on the Subject	8, 7	7
3	Short-term Tailored Training Programme	7, 6	16
4	Short-term NSQF Aligned Training Programme	6, 5	11
5	NSQF Aligned Courses	4, 3	6
6	Recognition of Prior Learning	4, 3, 2	4

From the above, it is clear that the majority of courses required are either short-term tailored training programmes (one to four weeks) or short-term NSQF aligned training programmes (one to two months). These two categories account for about two-thirds of the training programmes. However, most of the trainings currently available are generally bridge courses or advanced courses, targeting a limited group of people.

7. Training rollout plan

The courses are classified under four categories based on a multifactorial analysis – Very High Priority, High Priority, Moderate Priority, and Low Priority.

- There are 16 job roles at the 'Very High' priority level with a total of 0.934 million trainees. A majority of these trainees are municipal workers, PUC operators, and maintenance assistants for pollution control devices. The number of job roles at the 'High' priority level is seven, with 5,850 trainees. These are specialized job roles at NSQF levels five to seven. In the 'Moderate' and 'Low' categories, there are nine and ten job roles respectively, with a total of 6,375 trainees. In total, 0.95 million trainees will have to be trained over the next five years to meet the NCAP/NMCA goals. This will be Phase 1 of the proposed National Programme.
- Most of the trainees in Phase 1, will be trained in the first three years (approximately 94 per cent). The remaining 6 per cent, numbering approximately 55,000, will be trained in year four and five.
- Based on the progress made in Phase 1, a second phase can be rolled out for the remaining trainees. Phase 2 should be designed based on the mid-term evaluation of Phase 1 after three years.
- The Phase 1 training programmes will cost about ₹1,080 crore (US$ 140 million) over a period of five years. The majority of costs, however, will be incurred in the first three years when the largest numbers of trainees will be trained.
- The trainings can be funded from domestic sources, like the NCAP/NMCA, or multilateral organizations and foundations.
- The process of developing the training programmes will be different for different types of training. For RPL and NSQF aligned courses, the Skill Council for Green Jobs (SCGJ) or other relevant sector skill councils will have to develop standards and roll out the job roles in the form of National Occupational Standards (NOS) and Qualification Packs (QP). However, for bridge courses, advanced courses, and short-term tailored courses, trainings can be developed and delivered by any institution with competency.
- So far, 22 institutions – 18 domestic and four international – have been identified to develop these training programmes. As more domestic institutions gain competencies in developing trainings, they can be included in the list.

III. National Programme for Capacity Development for Air Quality Management

The ten salient features of the proposed National Programme are as follows:

1	**Scope:**	Training for 42 job roles in AQM; at least one training for each job role
2	**Training levels:**	National Skills Qualifications Framework level two to level eight
3	**Number of trainees:**	0.95 million
4	**Duration:**	Five years
5	**Budget:**	₹1,080 crore (US$ 140 million)
6	**Lead ministry:**	Ministry of Environment, Forest & Climate Change
7	**Expert institutions for training development:**	18 national and four international Institutes
8	**Training partners:**	National Knowledge Network, multilateral institutions, Institutes of Repute, key NGOs and think tanks, selected academic and research institutions, and training partners of sector skill councils
9	**Lead sector skill council:**	Skill Council for Green Jobs
10	**Major funding sources:**	National Skill Development Fund, National Clean Air Programme/ National Mission for Clean Air, and multilateral/bilateral agencies and foundations

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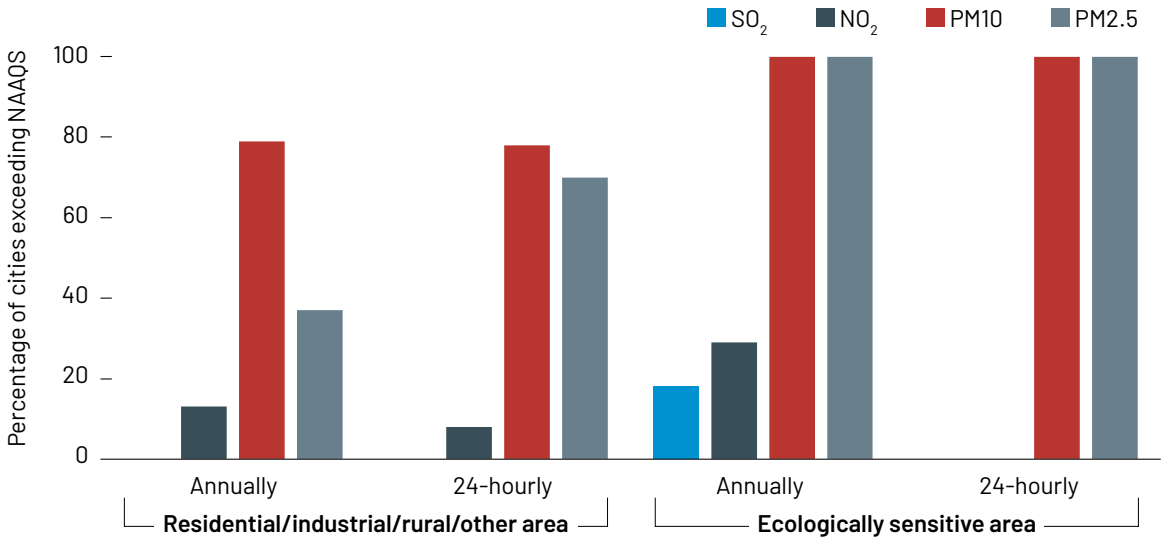
Introduction

1.1 Background

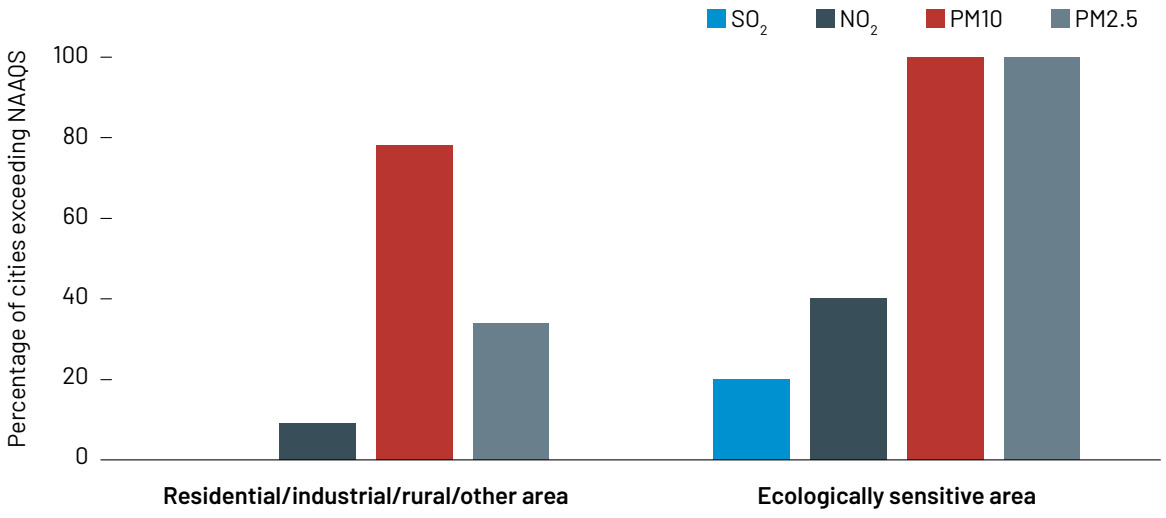
Air pollution is one of the five leading risk factors identified for Disability-Adjusted Life Years (DALYs) by the Indian Council of Medical Research (ICMR), Ministry of Health & Family Welfare.[2] India suffers from high levels of indoor and outdoor air pollution. According to the National Ambient Air Quality Status & Trends 2019, the latest nationwide report published by the Central Pollution Control Board (CPCB), about 79 per cent of monitoring stations/locations exceeded the National Ambient Air Quality Standards (NAAQS) in 2019. The percentage of cities exceeding NAAQS in 2019, based on the annual average concentration, was also about 78 per cent.

Figure 2: Monitoring locations exceeding NAAQS (Annual and daily)



Source: National Ambient Air Quality Status & Trends 2019, Central Pollution Control Board

Figure 3: Cities exceeding NAAQS (Annual)



Source: National Ambient Air Quality Status & Trends 2019, Central Pollution Control Board

The Ministry of Environment, Forest and Climate Change (MoEF&CC) has launched the National Clean Air Programme (NCAP) as a long-term, time-bound, national-level strategy to tackle the air pollution problem across the country in a comprehensive manner, with targets to achieve 20 per cent to 30 per cent reduction in Particulate Matter (PM) concentrations by 2024, keeping 2017 as the base year.

NCAP is a comprehensive, pan-India air pollution abatement scheme for 132 non-attainment cities. The non-attainment cities have been directed to assess risk from all sources of pollution, identify, prioritize, and implement

actions and strategies, and ensure time-bound implementation of City Action Plans (CAPs) with adequate monitoring and compliance. States/UTs have also been asked to develop their own clean air action plans.

A National Knowledge Network (NKN) has been formed as an advisory body to create adequate capacity in cities and states/UTs to implement present and future air quality management (AQM) efforts and support the implementation of the NCAP. Leading IITs, national laboratories, think tanks and NGOs are members of NKN.[3] It has been tasked with building local technical capacities of Institutes of Repute (IoRs) and providing knowledge and operational support to the Urban Local Bodies (ULBs), State Pollution Control Boards (SPCBs)/ Pollution Control Committees (PCCs), and the CPCB.

The Government of India is also in the process of launching a National Mission for Clean Air (NMCA) to adopt preventative measures against various contributors to air pollution and converge efforts at the city, state, and national levels through the involvement of various departments and ministries. One of the key objectives of the NMCA is capacity building for various stakeholders including SPCBs/PCCs and ULBs. A mission directorate comprising of knowledge, research and development, and communication units, established under the CPCB, will work in close coordination with the NKN to support these objectives. This directorate will also be responsible for the development of training modules/materials and the organization of training/ certificate courses for various target groups.

In light of the capacity development required for a successful implementation of NCAP/NMCA, NKN and the World Bank Group have partnered to design recommendations for the National Programme for Capacity Development for Air Quality Management.

The objectives of the proposed National Programme are to:

1. Map the AQM sector to identify job roles and their learning goals.
2. Recommend course content for various job roles.
3. Outline an engagement plan to reach the targeted participants.
4. Outline a cost estimate for the development and implementation of the National Programme.
5. Develop a rollout sequence and timetable for the trainings.

The proposed National Programme has been aligned with the requirements set under the National Skills Qualifications Framework (NSQF), to build synergy between capacity development and jobs (see Box 1).

This report outlines the proposed National Programme for Capacity Development for Air Quality Management and details its various components. It quantifies the number of jobs required in the AQM sector and recommends NSQF aligned courses for over 40 job roles in different types of organizations in India. It also assesses the adequacy of existing training systems and lists the required technical knowledge and skills for the identified job roles. Finally, it recommends a capacity-building strategy for the next five years to meet the goals of NCAP/NMCA.

This report is the first to present a comprehensive mapping of India's AQM sector and the various direct and indirect jobs within it. Such a mapping can help enable targeted capacity development as well as create new jobs in the sector.

Box 1: National Skills Qualifications Framework

NSQF is a nationally-integrated education and competency-based skill framework to enable a person to acquire desired competency levels. It was notified by the Government of India in December 2013. Its framework recognizes outcomes at ten different levels of competency – Level 1 (Basic) to Level 10 (Highly specialized). For each level of competency, a National Occupational Standard (NOS) is defined, which sets the standards of performance an individual must achieve when carrying out a function. Each NOS is accompanied by a curriculum package which includes syllabus, course manuals, trainer guides and manuals, and trainer qualifications.

The capacity development for AQM sector under NSQF will cover various competency aspects, including:

a) Responsibility: Making individuals working in the AQM sector aware of their responsibilities and training them on fulfilling these effectively and efficiently. This could include accountability for actions; the nature of working relationships; managing change; and a level of responsibility towards themselves and others.

b) Professional knowledge: The professional knowledge needed to fulfill responsibilities effectively and efficiently. This could include technical knowledge in various functional areas such as pollution monitoring and planning, enforcement and compliance, development of action plans, tendering and contracts, etc.

c) Professional skill: Professional skills include performance management (organizational and individual supervisory staff), teams management, stakeholders cooperation, project/activity management, approach to problem solving, etc.

d) Core skills: Core skills include communication skills involving written and oral literacy, numeracy skills, presentation skills, understanding of prevailing social, political, and natural environment, interpersonal skills, generic skills, negotiation skills, documentation skills, etc.

The knowledge and skills required at various NSQF levels are described below.

NSQF Level Descriptors

Level	Process Required	Professional Knowledge	Professional Skill	Core Skill	Responsibility
1	Prepares person to/carry out process that are repetitive on regular basis require no previous practice.	Familiar with common trade terminology, instructional words, meanings and understanding.	Routine and repetitive, takes safety and security measures.	Reading and writing; addition, subtraction; personal financing; familiarity with social and religious diversity, hygiene and environment.	No responsibility; always works under continuous instruction and close supervision.
2	Prepares person to/carry out processes that are repetitive, on a regular basis, with little application of understanding, more of practice.	Material, tools and applications in a limited context, understands context of work and quality.	Limited service skills used in limited context; select and apply tools; assist in professional works with no variables; differentiate good and bad quality.	Receive and transmit written and oral messages, basic arithmetic, personal financing, understanding of social, political, and religious diversity, hygiene and environment.	No responsibility; works under instruction and close supervision.
3	Person may carry out a job which may require limited range of activities routine and predictable.	Basic facts, process and principle applied in trade of employment.	Recall and demonstrate practical skill, routine and repetitive in narrow range of application	Communication written and oral, with minimum required clarity, skill of basic arithmetic and algebraic principles, personal banking, basic understanding of social and natural environment.	Under close supervision Some responsibility for own work within defined limit.

Level	Process Required	Professional Knowledge	Professional skill	Core skill	Responsibility
4	Work in familiar, predictable, routine, situation of clear choice.	Factual knowledge of field of knowledge or study.	Recall and demonstrate practical skill, routine and repetitive in narrow range of application, using appropriate rule and tool, using quality concepts.	Language to communicate written or oral, with required clarity, skill to basic arithmetic and algebraic principles, basic understanding of social political and natural environment.	Responsibility for own work and learning.
5	Job that requires well developed skill, with clear choice of procedures in familiar context.	Knowledge of facts, principles, processes and general concepts, in a field of work or study.	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information.	Desired mathematical skill; understanding of social, political; and some skill of collecting and organising information, communication.	Responsibility for own work and learning and some responsibility for others' works and learning.
6	Demands a wide range of specialised technical skill, clarity of knowledge and practice in broad range of activity involving standard and non-standard practices.	Factual and theoretical knowledge in broad contexts within a field of work or study.	A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study.	Reasonable good in mathematical calculation, understanding of social, political and reasonably good in data collecting organising information, and logical communication.	Responsibility for own work and learning and full responsibility for other's works and learning.
7	Requires a command of wide-ranging specialised theoretical and practical skills, involving variable routine and non-routine contexts.	Wide-ranging factual and theoretical knowledge in broad contexts within a field of work or study.	Wide range of cognitive and practical skills required to generate solutions to specific problems in a field of work of study.	Good logical and mathematical skill understanding of social political and natural environment and organising information, communication and presentation skill.	Full responsibility for output of group and development.
8	Comprehensive, cognitive, theoretical knowledge and practical skills to develop creative solutions to abstract problems. Undertakes self-study; demonstrates intellectual independence, analytical rigour and good communication.			Exercise management and supervision in the context of work/study having unpredictable changes; responsible for the work of others.	
9	Advanced knowledge and skill. Critical understanding of the subject, demonstrating mastery and innovation, completion of substantial research and dissertation.			Responsible for decision making in complex technical activities involving unpredictable work/study situations.	
10	Highly specialised knowledge and problem solving skill to provide original contribution to knowledge through research and scholarship.			Responsible for strategic decisions in unpredictable complex situations of work/study.	

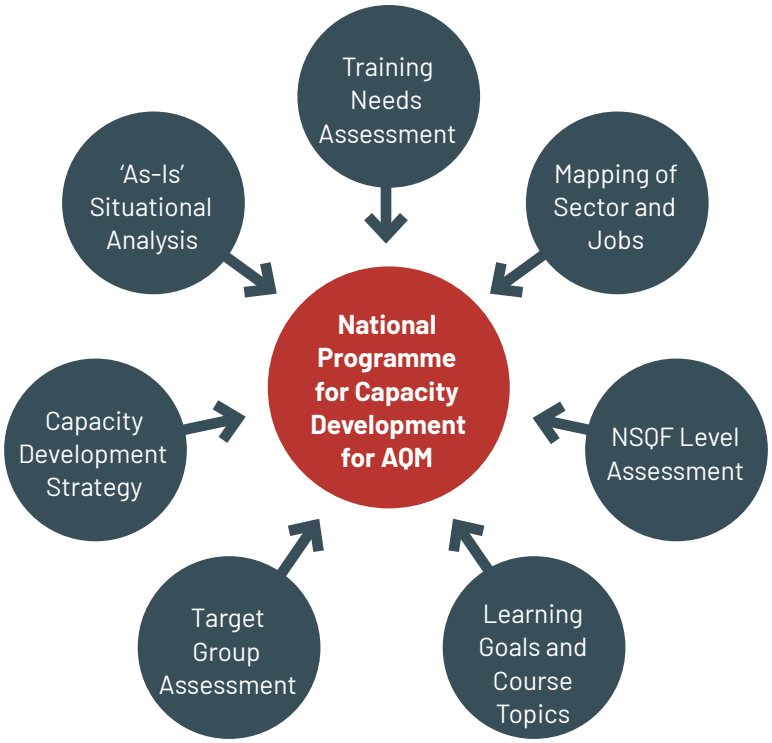
Source: Notification dated 27 December, 2013, Department of Economic Affairs, Ministry of Finance, Government of India.

1.2 Methodology

Air quality management is multi-sectoral, multi-functional, and multi-jurisdictional. The source of air pollution varies from point sources like industries to area sources like biomass burning and mobile sources like automobiles. The functional areas vary from pollution monitoring to planning, implementation, enforcement, etc. Jurisdictional power to manage air quality is vested in ULBs, state governments, and the Central Government.

To capture the multidimensionality of AQM, the National Programme for Capacity Development for Air Quality Management has been envisioned using a sevenfold approach.

Figure 4: Sevenfold approach for development of the National Programme



1. 'As-Is' situational analysis: This was done to assess the current training and capacity-building initiatives and map the key institutions/organizations providing these training programmes.

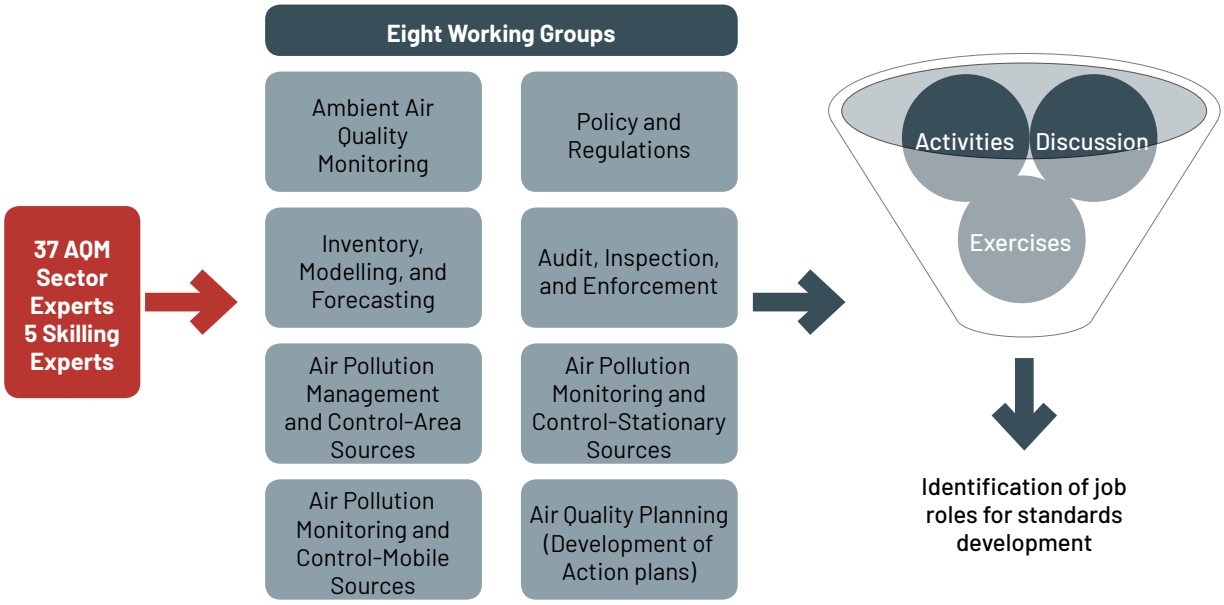
Under this exercise, an assessment of 96 training programmes on AQM, currently offered by national and international organizations, was carried out. A detailed mapping of the 22 institutions/organizations (18 national and four international) providing these training programmes was also done.

2. Training needs assessment (TNA): A TNA of ULBs, pollution control boards, IoRs and other stakeholders, including consultants and industries was conducted on an 'Awareness-Relevance-Requirement' matrix.

Conducted online, the TNA survey elicited self-assessment responses from the participants on 16 knowledge and skill topics. These topics were selected by the NKN members on the basis of training priority. About 1200 professionals working in the field of AQM were approached to participate in the TNA and 288 of them completed the survey.

3. Mapping of sector and jobs: The AQM sector, current and future job roles involved in it, and the knowledge and skill requirements for them were mapped through an expert consultation workshop held in Delhi on 28 March 2022 and 29 March 2022. More than 40 AQM sector and skill sector experts participated in the workshop. The expert group comprised NKN members, academicians, industry experts, experts from the World Bank Group and representatives from NGOs/think tanks, skill councils, and pollution control boards. The experts were divided into eight working groups for the purpose of mapping the sector (see Figure 5).

Figure 5: Expert workshop to map the AQM sector



4. NSQF level assessment: A detailed analysis of the NSQF framework was undertaken to match AQM jobs with NSQF levels. This included occupational mapping, NSQF-level analysis, and mapping of desired competencies at various NSQF levels. In total, 42 job roles were mapped with NSQF levels.

5. Learning goals and course topics: Based on the knowledge and skill requirements of various job roles and their respective NSQF levels, the learning goals and course topics for the 42 job roles were mapped.

6. Target group assessment: A detailed primary and secondary survey was done to estimate the number of organizations, institutions, and industries related to the AQM sector in India. These organizations/institutions/industries were mapped with the 42 job roles to estimate the total number of jobs required to meet the goals of NCAP/NMCA. These jobs were then categorized into different organization types and NSQF levels.

7. Capacity-development strategy: A detailed strategy to roll out the trainings was developed. Different types of training and the number of people to be trained in the next five years were estimated based on the target group assessment. An assessment of training costs was also undertaken simultaneously to estimate the total cost of training over the next five years. An assessment of national and international institutions was done to identify partners for the development and delivery of training. Based on the above, a rollout strategy for the proposed National Programme for Capacity Development for Air Quality Management is recommended.

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Training Needs Assessment

A training needs assessment (TNA) of 288 professionals working in the field of air pollution was carried out to assess the training requirements of professionals working in the air pollution sector in varying capacities.

The TNA was conducted on the 'Awareness-Relevance-Requirement' matrix, in which:

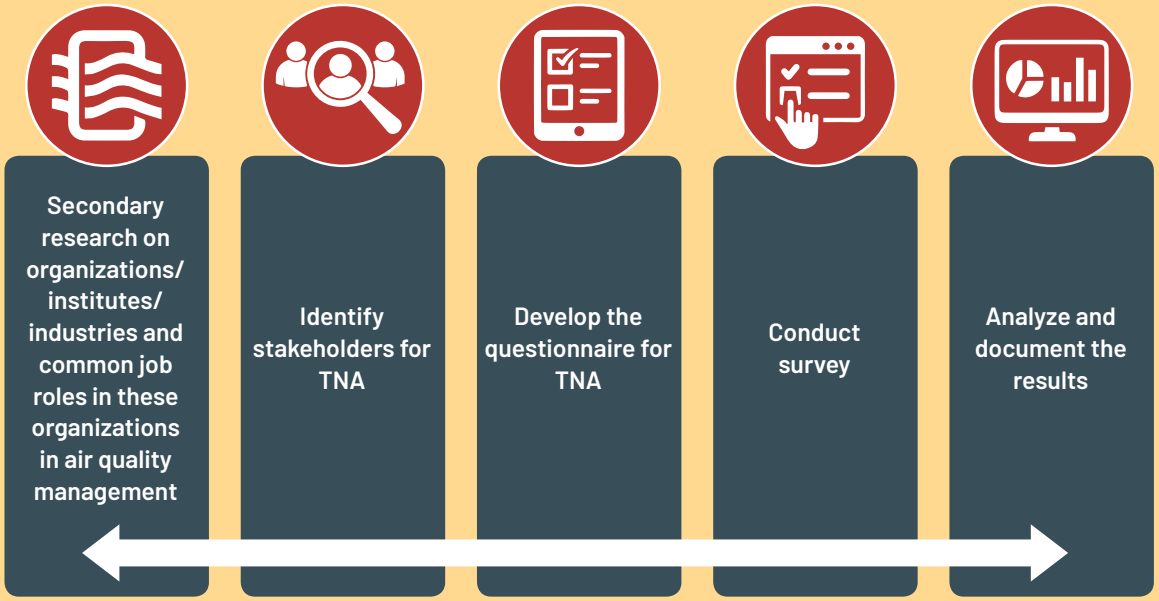
- Awareness measured the participant's knowledge of a topic;
- Relevance assessed the relevance of a topic to the participant's job role; and,
- Requirement measured whether a participant needed training in a specific topic.

The methodology used for the TNA is given in Box 2.

Box 2: Training needs assessment

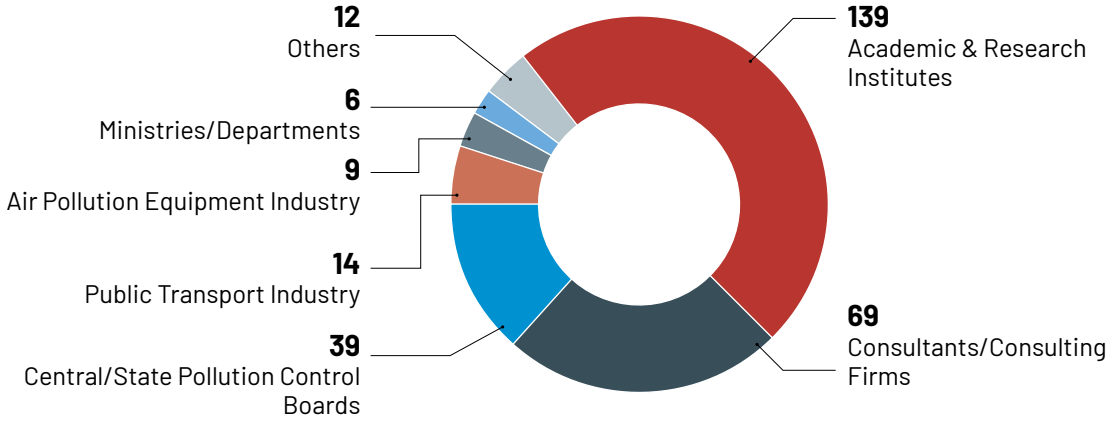
A comprehensive five-step process was adopted to conduct the TNA. This included a detailed survey to identify the stakeholders, development of the TNA questionnaire, execution of survey through an online survey platform (SurveyMonkey), and finally an analysis of the documented results.

About 1200 professionals working in the air pollution sector from across the country were invited to participate, out of which 288 completed the survey.



Nearly half of the surveyed experts belonged to academic and research organizations, while a quarter of them were consultants. Pollution control board employees accounted for 14 per cent of those surveyed, and the rest represented the public transport industry, air pollution equipment industry, various ministries and departments, etc.

Figure 6: Organization categories of the surveyed experts



The TNA survey was focused on the following 16 topics to understand their significance for the surveyed experts across three parameters: relevance, awareness, and training requirements. The topics were selected by the NKN members as topics of priority under air quality management (AQM).

Table 2: List of topics for the TNA

Advanced Instrumentation	Data Analysis & Interpretation
Air Pollution & Climate Change	Emission Inventory
Air Pollution & Health	Health and Safety
Air Pollution Prevention & Control	Modelling
Air Quality Monitoring	Leadership
Air Quality Policies & Regulations	NCAP & Action Plan
Airshed Management & City Action Plan	Stakeholders Engagement
Basics of Air Pollution	Team Management

2.1 Overview of the assessment

The following results emerge for the entire sector from the TNA:

Awareness: There is a wide variation in the awareness-level of experts across the identified topics. Overall, the awareness is high for general topics such as basics of air pollution, air pollution and climate change, air pollution and health, team management, and leadership. The lowest awareness is recorded for technical topics such as airshed management, modelling, advanced instrumentation for monitoring, and emission inventory. Typically, academic and research experts, as well as officials from ministries/departments, reported a higher awareness of all the listed topics, particularly the technical topics (see Figure 8).

Relevance: Experts from all the categories identified all topics listed in the needs assessment survey as important. The most relevant among these were air pollution and climate change, basics of air pollution, air pollution prevention and control, and team management (See Figure 9).

Training requirement: Experts identified a high training requirement in all topics, except for advanced instrumentation for monitoring, which is a specialized skill required in a limited set of jobs. The highest training requirement (more than 75 per cent respondents) was identified in air quality monitoring, emission inventory, modelling, data analysis, air pollution prevention and control, and skill topics such as team management, leadership, and stakeholder engagement (see Figure 10).

Figure 7: TNA results across all organization categories

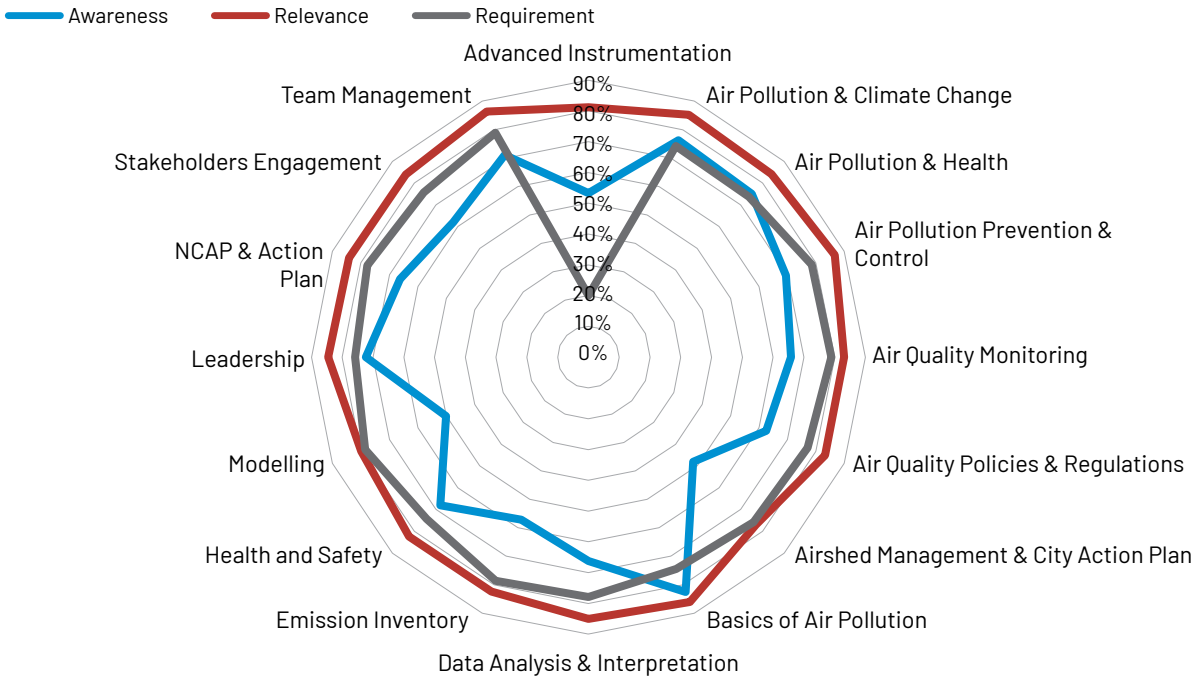


Figure 8: Awareness across organization categories

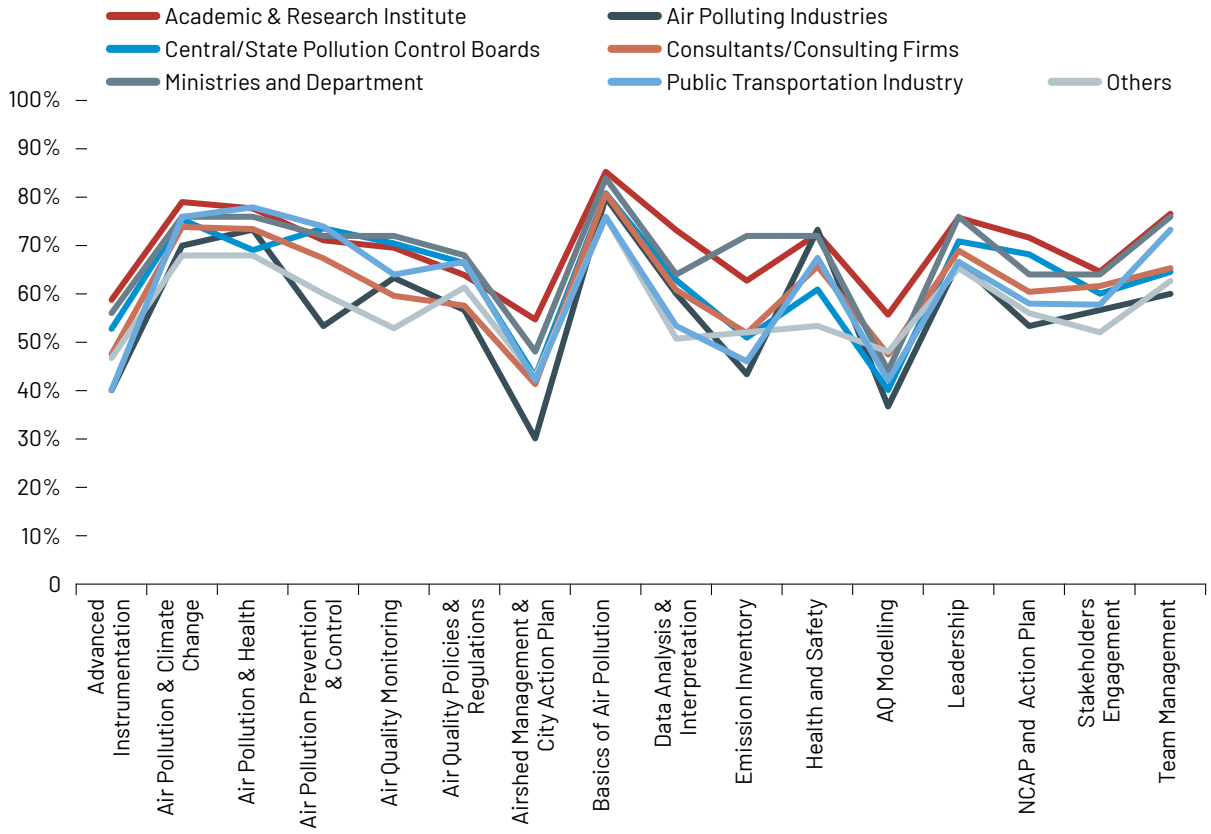


Figure 9: Relevance across organization categories

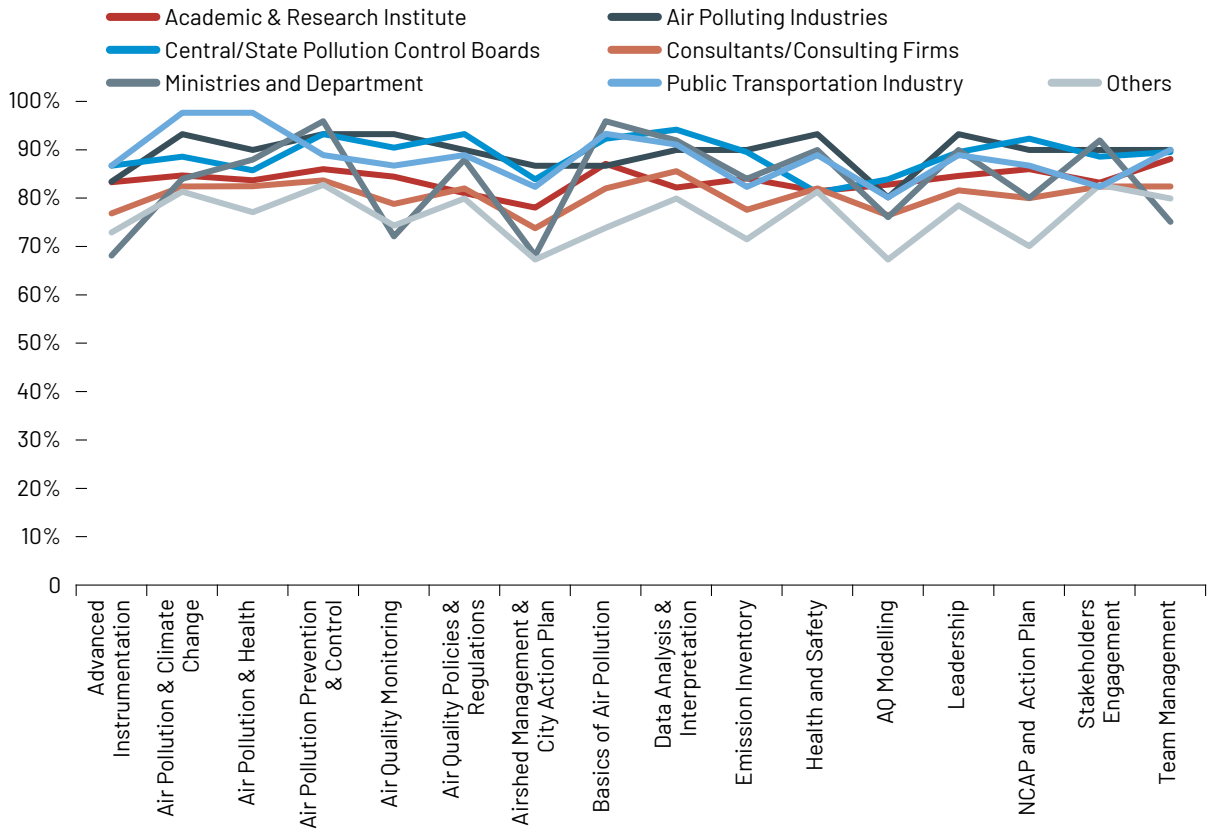
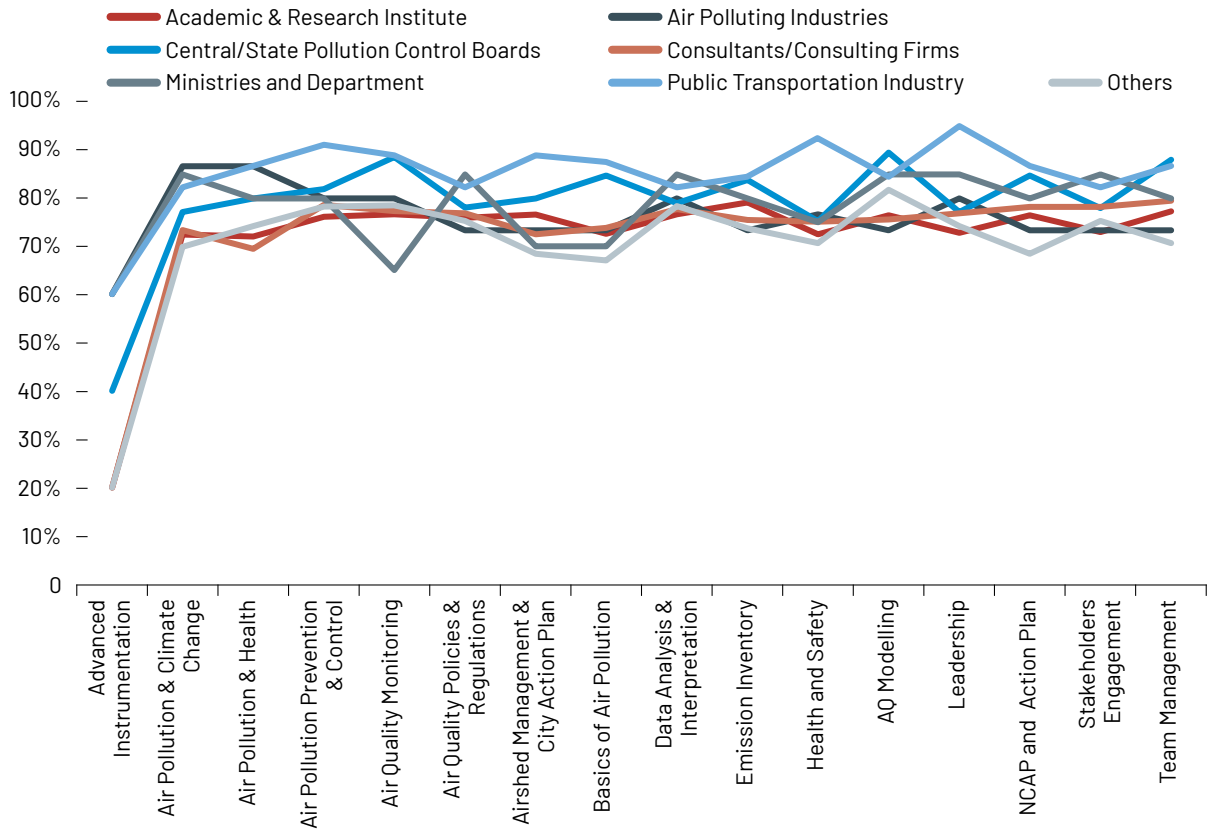


Figure 10: Training requirements across organization categories



The key results for the top three categories of organizations captured in the TNA are given below.

2.2 Assessment of Academic and Research Institutions

These institutions report a high degree of awareness about several relevant topics such as team management, leadership, basics of air pollution, and air pollution and climate change.

The awareness and relevance for topics like airshed management, city action plan, and modelling are reported to be comparatively low. Emission inventory and data analytics are identified as topics of high training requirement. Other topics identified as important for training are team management, air quality monitoring, and airshed management.

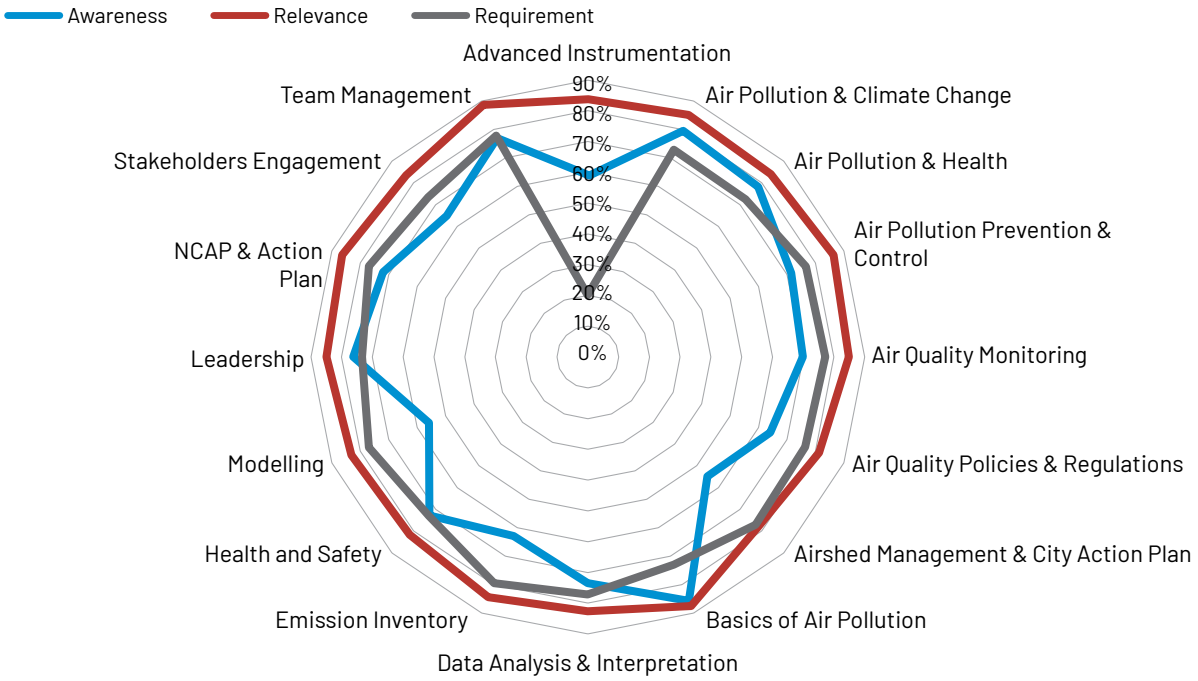
The topics considered less important for trainings include general topics, which these institutions already report a high awareness of, like the basics of air pollution, climate change, and health. Low training requirement is reported for the topic advanced instrumentation for monitoring, even as it ranks low on awareness, as this topic is required by only a limited set of experts.

Putting Awareness, Relevance and Requirement together, the following topics emerge as a priority for training for the academic and research institutions: emission inventory, modelling, data analytics, airshed management and city action plans.

Table 3: TNA results for Academic and Research Institutes

	High	Low
Topics of Awareness	• Basics of Air Pollution • Air Pollution and Climate Change • Air Pollution and Health • Team Management • Leadership	• Airshed Management • Modelling • Advanced Instrumentation for Monitoring • Emission Inventory • Air Quality Policies and Regulations
Topics of Relevance	• Team Management • Basics of Air Pollution • National Clean Air Programme and Action Plan • Air Pollution Prevention and Control • Air Pollution and Climate Change	• Airshed Management • Air Quality Policies and Regulations • Health and Safety • Data Analysis and Interpretation • Modelling
Topics of Training Requirement	• Emission Inventory • Team Management • Air Quality Monitoring • Data Analysis and Interpretation • Airshed Management	• Advanced Instrumentation for Monitoring • Air Pollution and Health • Air Pollution and Climate Change • Health and Safety • Basics of Air Pollution

Figure 11: TNA results for Academic and Research Institutes



2.3 Assessment of Consultants/Consulting Firms

Among consultants, the highest awareness was reported on general topics pertaining to basics of air pollution and air pollution and climate change, health, and leadership as well as on air pollution prevention and control.

Low awareness was recorded for some specialized subjects such as airshed management and city action plan, modelling, advanced instrumentation for monitoring, and emission inventory, but the surveyed experts identified these topics as less relevant.

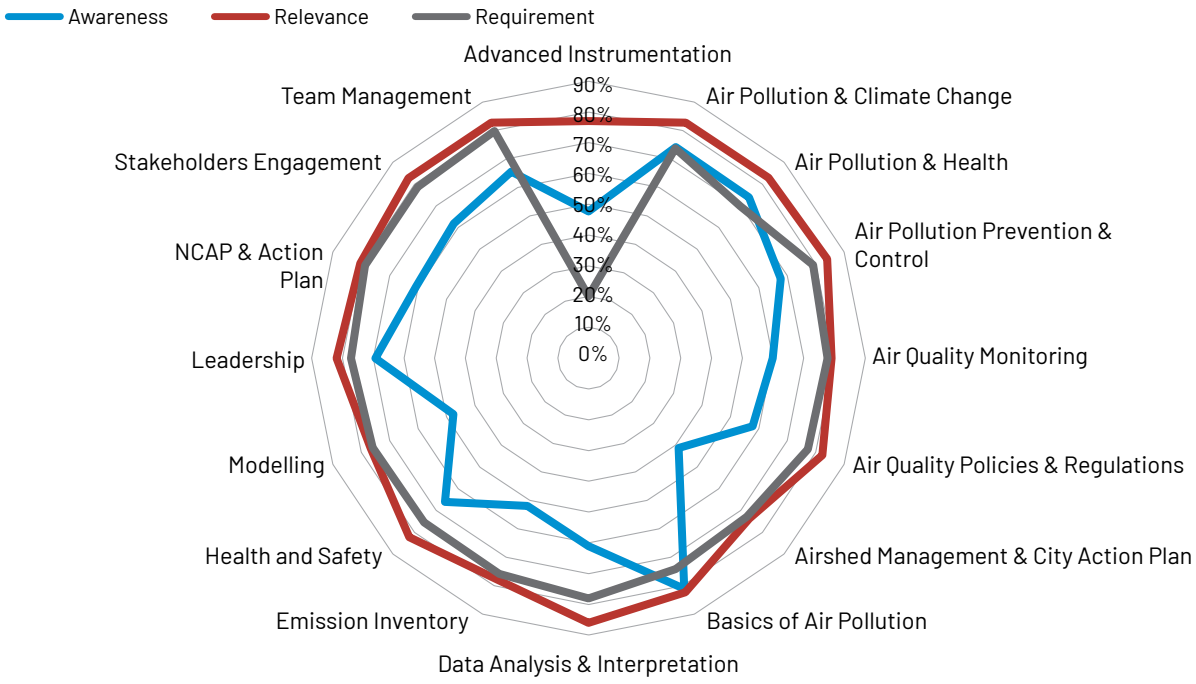
Highest training priority was assigned to topics like team management, air pollution prevention and control, introduction to NCAP and development of city action plan (CAP), stakeholder engagement, and data analysis and interpretation. This also aligns with the high relevance for these topics.

As with the other organization groups, the lowest training requirement was recorded for the specialized topic of advanced instrumentation for monitoring, and for general topics like air pollution and health, air pollution and climate change, and basics of air pollution.

Table 4: TNA results for Consultants/Consulting Firms

	High	Low
Topics of Awareness	• Basics of Air Pollution • Air Pollution and Climate Change • Air Pollution and Health • Leadership • Air Pollution Prevention and Control	• Airshed Management • Modelling • Advanced Instrumentation for Monitoring • Emission Inventory • Air Quality Policies and Regulations
Topics of Relevance	• Data Analysis and Interpretation • Air Pollution Prevention and Control • Air Pollution and Health • Stakeholders Engagement • Air Pollution and Climate Change	• Airshed Management • Modelling • Advanced Instrumentation for Monitoring • Emission Inventory • Air Quality Monitoring
Topics of Training Requirement	• Team Management • Air Pollution Prevention and Control • National Clean Air Programme and Action Plan • Stakeholders Engagement • Data Analysis and Interpretation	• Advanced Instrumentation for Monitoring • Air Pollution and Health • Airshed Management • Air Pollution and Climate Change • Basics of Air Pollution

Figure 12: TNA results for Consultants/Consulting Firms



Putting Awareness, Relevance and Requirement together, the following topics emerge as a priority for training for the consulting firms: air pollution prevention and control, monitoring, emission inventory, modelling, data analytics, airshed management and city action plans.

2.4 Assessment of Central and State Pollution Control Boards

Central Pollution Control Board (CPCB) and State Pollution Control Board (SPCB) officials register a high awareness about topics relevant to regulators such as the basics of air pollution, air pollution and climate change, air pollution prevention and control, air quality monitoring, and leadership.

On technical topics like modelling, airshed management, and advanced instrumentation for monitoring, both awareness and relevance is reported to be low.

The most-relevant topics for regulators are identified as data analysis and interpretation, air pollution prevention and control, air quality policies and regulations, introduction to NCAP and city action plans, and basics of air pollution.

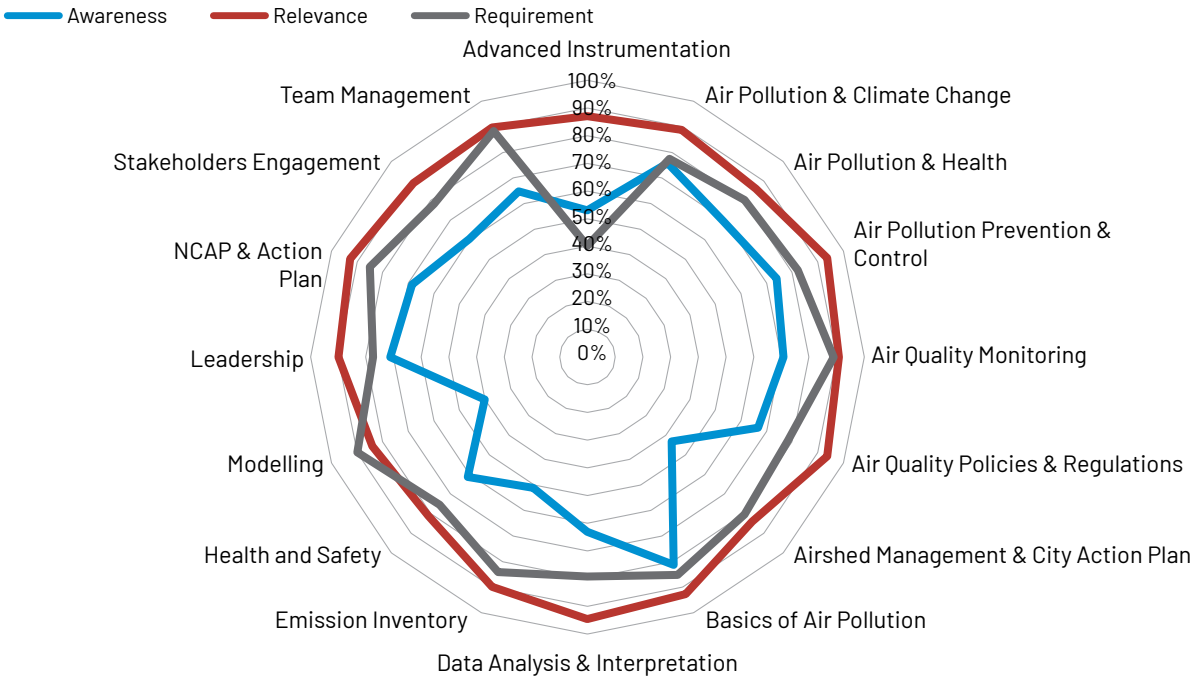
Unlike other major organization categories, CPCB and SPCBs identified trainings as important for some of the general topics, such as basics of air pollution and team management. Trainings for capacity building in modelling, air quality monitoring, and city action plans were also identified as high requirement.

As with the other organization groups, low training requirement was recorded for the specialized topic of advanced instrumentation for monitoring as well as for general topics pertaining to health, climate change, leadership, and stakeholder engagement.

Table 5: TNA results for Pollution Control Boards

	High	Low
Topics of Awareness	• Basics of Air Pollution • Air Pollution and Climate Change • Air Pollution Prevention and Control • Leadership • Air Quality Monitoring	• Modelling • Airshed Management • Emission Inventory • Advanced Instrumentation for Monitoring • Stakeholders Engagement
Topics of Relevance	• Data Analysis and Interpretation • Air Pollution Prevention and Control • Air Quality Policies and Regulations • National Clean Air Programme and Action Plan • Basics of Air Pollution	• Health and Safety • Modelling • Airshed Management • Air Pollution and Health • Advanced Instrumentation for Monitoring
Topics of Training Requirement	• Modelling • Air Quality Monitoring • Team Management • National Clean Air Programme and Action Plan • Basics of Air Pollution	• Advanced Instrumentation for Monitoring • Health and Safety • Air Pollution and Climate Change • Leadership • Stakeholders Engagement

Figure 13: TNA results for Pollution Control Boards



Putting Awareness, Relevance and Requirement together, the following topics emerge as a priority for training for the pollution control boards: policy and regulations, prevention and control, monitoring, action plans, modelling and inventory.

Overall, the demand for training was very high among the stakeholders. They demanded training not only in technical areas, but also in skills such as leadership, team management, and stakeholder engagement.

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Assessment of Existing Training Courses

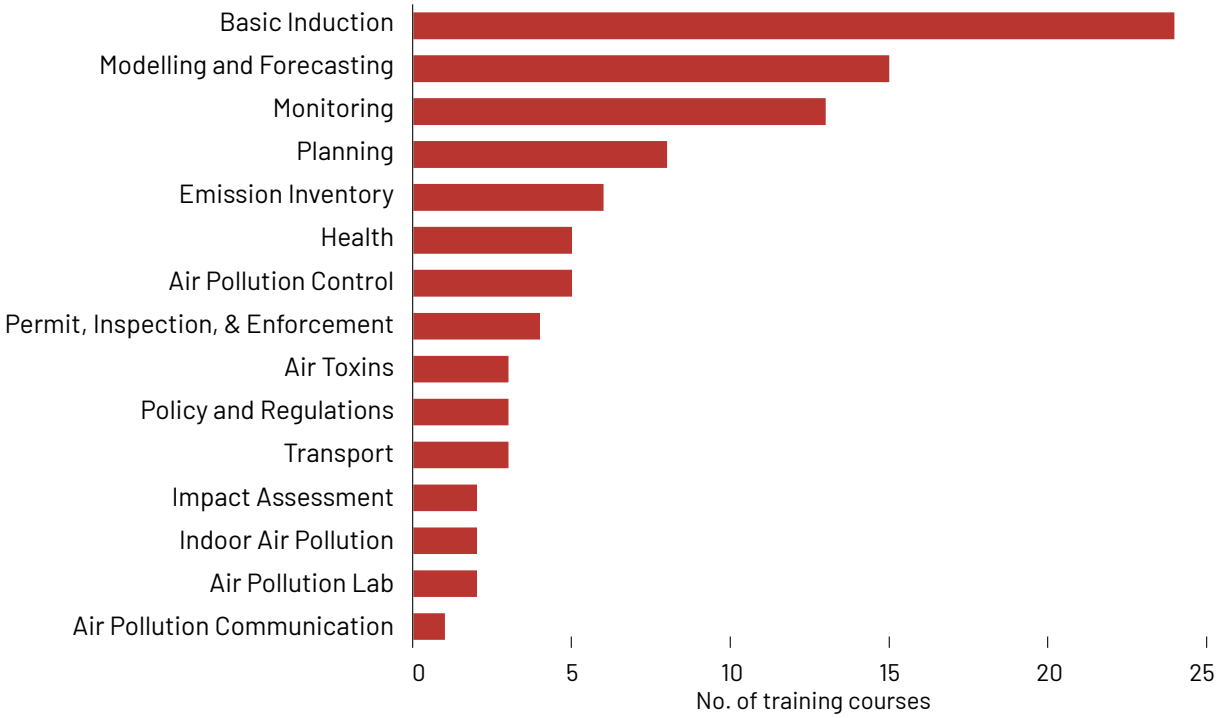
In 2020, the World Bank Group commissioned a study on the 'Learning Needs Assessment of Air Quality Management in India' to eKonnect Knowledge Foundation.[4] The scope of the assignment included the identification of the current courses on air quality management (AQM) available to professionals in India. eKonnect identified 96 courses (see Annexure 1). These 96 such courses have been analyzed to assess the type, duration, and delivery of existing training programmes. The findings are discussed below.

3.1 Course categories

Despite the vastness of air pollution as a subject, only a limited range of courses are currently available under it. Of the 96 courses, a quarter were found to be basic induction courses on understanding and managing air quality and pollution control technologies. Specialized technical training in air pollution modelling and forecasting emerged as the second most offered course (16 per cent), followed by monitoring techniques (14 per cent), planning (8 per cent), and emission inventory (6 per cent). The remaining 31 per cent of the sample is accounted for by ten different categories of training courses.

Most of the courses target a general and broad base of trainees, including students, faculty, researchers, regulators, and consultants. Few of them aim at building capacity of urban local bodies (ULBs), industries, and specialized agencies like financial institutions.

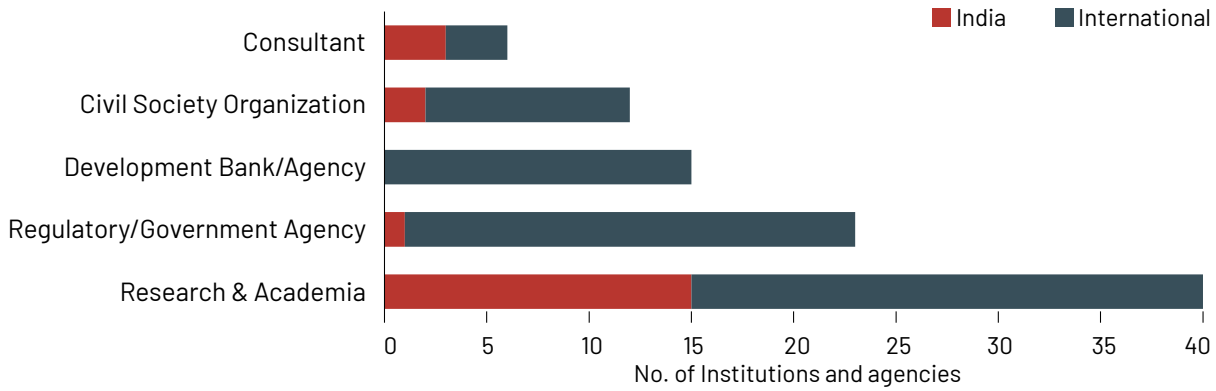
Figure 14: Number of training courses by category



3.2 Course delivery agencies

A majority of these training courses (42 per cent) are delivered by Indian and international research and academic institutions (See Figure 15). Among the Indian academic institutes, most are government-backed premier institutions. A quarter of the courses in the sample are being delivered by mostly foreign government agencies working on environmental and pollution issues. Many courses (16 per cent) are also being delivered by development banks/agencies like the World Bank Group, Asian Development Bank (ADB), Japan International Cooperation Agency (JICA) etc. Lastly, courses offered by the civil society organizations and consultants represent 13 per cent and 6 per cent of the sample, respectively. Overall, a clear majority of these courses (78 per cent) are being delivered by foreign governments, international institutions, and multilateral organizations.

Figure 15: Number of courses offered by training delivery agencies



3.3 Delivery mode and duration

More than half of the training courses (55 per cent) are conducted in physical mode, with international institutions largely conducting face-to-face courses. While 38 per cent of the trainings take place in virtual mode, 5 per cent offer a hybrid mode. A majority of the e-learning courses are self-paced and offer varying durations, while most of the face-to-face training courses are short-term, lasting about a week. A handful of physical training courses that are provided are spread over a longer duration of 15 to 120 days.

Figure 16: Mode of delivering training courses

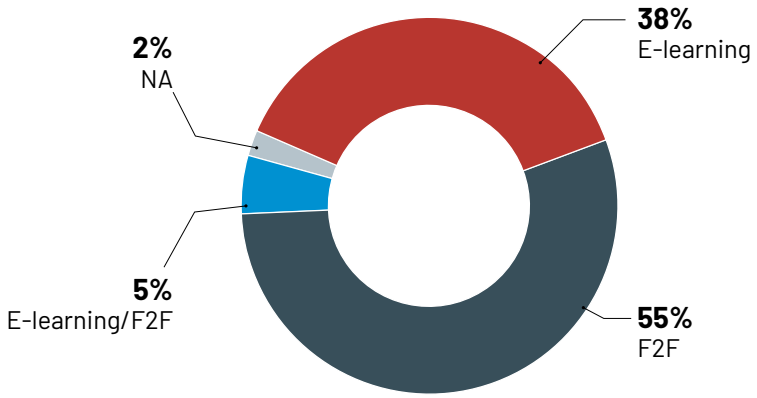
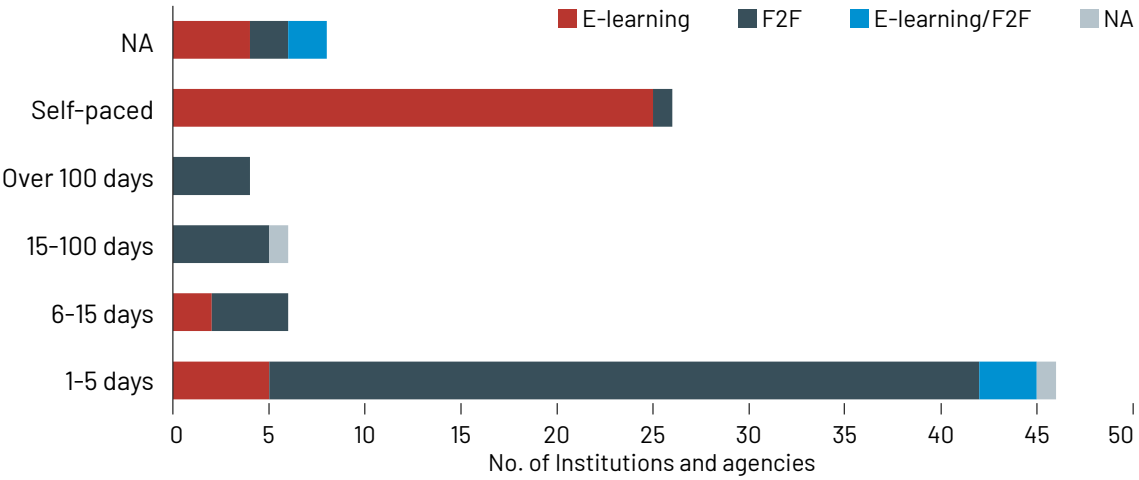


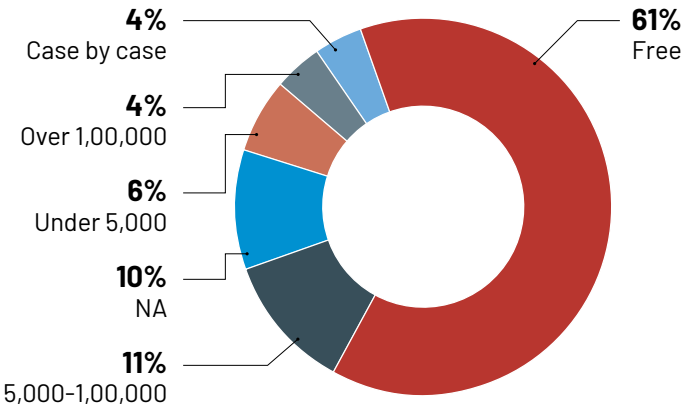
Figure 17: Duration of training courses



3.4 Training fees

A lot of these courses (64 per cent) are available free of cost to participants, while for 6 per cent of the courses the fee is under ₹5,000. For 11 per cent of the courses, the fee ranges from ₹5,000 to ₹1,00,000, and 4 per cent of the courses charge over ₹1,00,000.

Figure 18: Fees for training courses



Overall, the courses have not been designed keeping an Indian audience in mind. First, most courses are developed internationally and delivered by international organizations. While the technical aspects of air quality management are similar across the world, the socio-economic aspects and the implementation frameworks vary widely. Second, most courses in the same category have very similar content. For example, a quick analysis of the curriculum of basic induction courses indicates great similarities between them. Lastly, these courses are orientation courses and are not linked with jobs. They teach technical aspects and do not include skills in their curriculum. Thus, there is a requirement to develop India-relevant training courses to meet the needs of various target groups. This will not only upskills existing professionals but also creates new jobs.

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Mapping the AQM Sector

Managing air quality requires a workforce trained to plan, organize, monitor, mitigate, and control air pollution from various sources. But who comprises this workforce? Where are these people employed? What kind of skills do jobs under air quality management (AQM) require? We can only answer these questions through a detailed examination of the AQM sector. This section lays out the contours of the AQM sector in India. It maps relevant organizations/industries, details job roles, maps them to their National Skills Qualifications Framework (NSQF) level, lists the required technical and professional knowledge, and estimates the number of jobs in the sector.

4.1 Defining the sector

As per the Air (Prevention and Control of Pollution) Act, 1981, "air pollutant" means any solid, liquid, or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.

Based on the above definition, any organization or individual working in planning, organizing, monitoring, mitigating, and/or controlling air pollutants can qualify as part of the AQM sector. But this definition is too broad and all-encompassing, therefore, it needs further delineation to focus on the most important actors in the AQM sector. This can be done by bifurcating the sector into jobs that are directly involved and those that are indirectly involved in managing air quality.

1. Direct jobs: Direct jobs refer to all jobs that primarily work in planning, organizing, monitoring, mitigating, and/or controlling air pollutants. These jobs are performed by a dedicated workforce that can clearly demonstrate their contribution to the AQM sector. Examples of such jobs include pollution regulators, Pollution Under Control (PUC) inspectors, manufacturers and operators of air pollution monitoring and control equipment, environment managers in industries, policymakers of the environment ministry, scientists working on pollution monitoring, experts and researchers working on air quality management, etc.

In India, these jobs are mainly available with central and state pollution control boards, academic and research institutions, NGOs and think tanks, consulting firms, laboratories, air polluting industries, and air pollution monitoring and control industries.

2. Indirect jobs: Indirect jobs refer to all jobs that indirectly contribute towards mitigating and/or controlling air pollutants. Air quality management is not the primary responsibility of these jobs. These jobs are performed by a workforce that directly or indirectly supports the direct jobs or provides alternatives to the existing sources of pollution. Examples of such jobs include manufacturers and distributors of clean cooking stoves, mechanical sweeper operators, horticulturists, urban planners, waste management experts, clean energy experts, transport planners, boiler inspectors, occupational health and safety experts, etc.

In India, these jobs are mainly available with urban local bodies (ULBs), regulatory authorities related to industry, labour, land, forest etc., various policymaking authorities, academic and research institutions, consulting firms, NGOs, industries providing alternatives, and other related industries.

While all jobs are important, there are some jobs which play a more important role in AQM than others. From the expert consultation workshop held on 28 March 2022 and 29 March 2022 (see Section 1.2), 17 types of organizations were identified as having the most important role and providing the most direct jobs and important indirect jobs in the AQM sector (see Figure 19).

Figure 19: Key organizations in the AQM sector

01	Ministry of Environment, Forest & Climate Change	07	Institute of Repute (IoR)	13	Air Pollution Monitoring and Control
02	Department of Environment in States/UTs	08	Other Academic and Research Institutes	14	Government/Private Laboratories
03	Other Central Government Ministries related to AQM	09	NGOs/Think Tanks	15	Media
04	Other State/UT Government Departments related to AQM	10	Urban Local Bodies	16	Financial Institution/ Economic Institutes
05	Central Pollution Control Board	11	Consultants/Consulting Firms	17	Health Agencies/Institutes
06	State Pollution Control Boards/Committees	12	Air Polluting Industries		

The roles and responsibilities of these organizations in AQM and their ideal occupational map and job roles are given in Annexure 2. It is important to mention that while many of the job roles do not currently exist, they are required to fulfill the roles and responsibilities of these organizations under the National Clean Air Programme (NCAP).

4.2 Job roles by sub-sectors

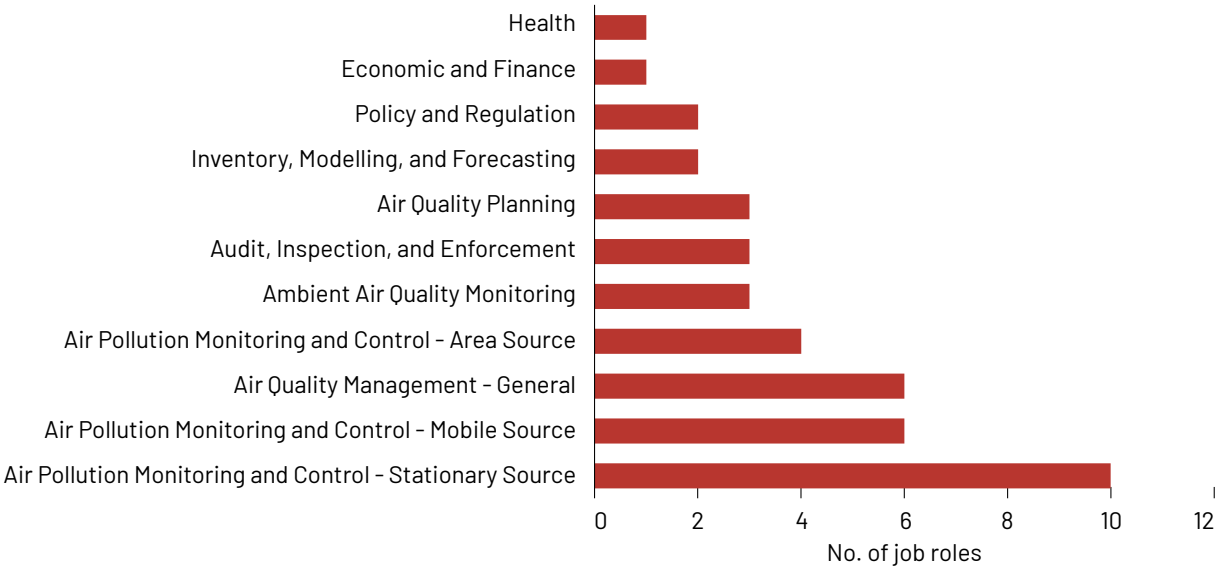
The expert consultation workshop identified 42 job roles as the most important for meeting the goals of the NCAP/NMCA. These roles have been classified into 11 categories/sub-sectors based on specialization as shown in Figure 20.

Figure 20: AQM sub-sectors

01	Air Quality Management - General	06	Ambient Air Quality Monitoring
02	Air Quality Planning	07	Air Pollution Monitoring and Control - Area Source
03	Policy and Regulation	08	Air Pollution Monitoring and Control - Mobile Source
04	Inventory, Modelling, and Forecasting	09	Air Pollution Monitoring and Control - Stationary Source
05	Audit, Inspection, and Enforcement	10	Economic/Finance
11	Health		

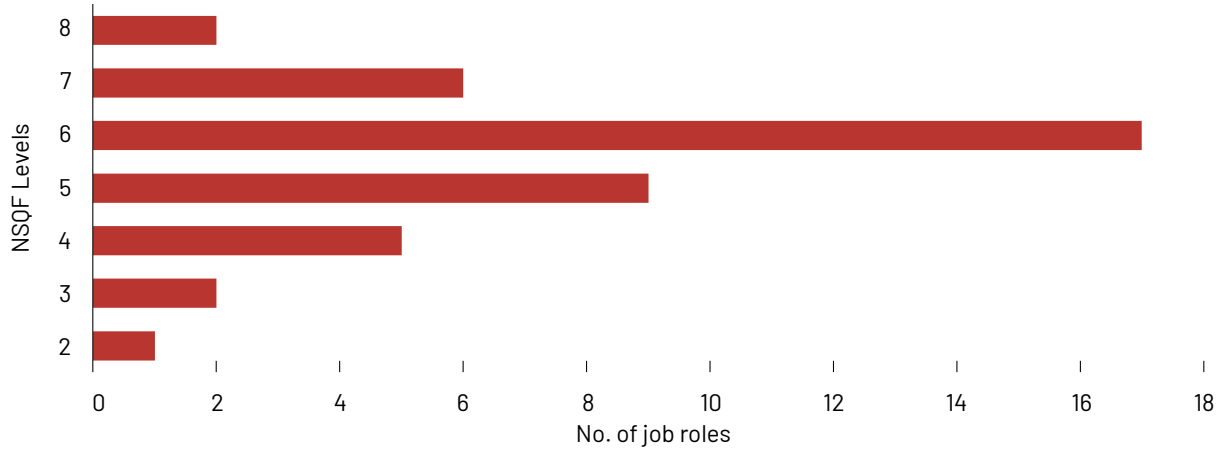
The maximum types of job roles are in air pollution monitoring and control – stationary source sub-sector (ten job roles). This is followed by air quality management – general and air pollution monitoring and control – mobile source, with six job roles each. These three categories account for more than half of all the job roles (see Figure 21).

Figure 21: Sub-sector-wise number of job roles



Most job roles are at NSQF levels four, five, and six (31 out of 41 job roles). NSQF level six has the highest number of job roles. At NSQF level six, the job role demands a wide range of specialized technical skill, knowledge, and practice in a broad range of activity (See Box 1; Section 1.1). This is a middle-management level position and the job roles vary from a specialist in policy and regulation to an air quality manager in a ULB.

Figure 22: Number of job roles at various NSQF levels



The 42 job roles with their respective NSQF levels and organizational affiliations are given below in Table 6. For each job role, the skill, knowledge and the training requirement is listed in Section 4.3. The organization-wise job roles are given in Annexure 2.

Table 6: Agencies and job roles in the AQM sector

S. No.	Sector/Sub-sector	Job Role	NSQF Level	MoEF&CC	Department of Environment in States/UTs	CPCB	SPCB/PCCs	ULB	IoR	Other Academic and Research Institutes	NGOs/Think Tanks	Consultants/ Consulting Firms	Air Polluting Industries	Air Pollution Monitoring and Control	Government/Private Laboratories	Media	Financial Institution/ Economic Institutes	Health Agencies/Institutes
1	Air Quality Management	Head of Govt. Department/ Commissioner of ULB/CEO of Company	8	✔	✔			✔			✔	✔	✔	✔			✔	✔
2	Air Quality Management	Programme Head/ Project Head/ Department Head	8			✔	✔		✔	✔	✔	✔	✔	✔				
3	Air Quality Planning	Sector Expert	7	✔	✔	✔	✔		✔	✔	✔	✔						
4	Audit, Inspection, and Enforcement	Regional Air Quality Manager/Senior Regulator/ Senior Auditor/Chief Environment Manager	7	✔	✔	✔	✔					✔	✔					
5	Policy and Regulation	Sector Expert	7	✔	✔	✔	✔		✔		✔	✔					✔	✔
6	Air Pollution Monitoring and Control - Mobile Source	Sector Expert	7	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔			
7	Air Pollution Monitoring and Control - Area Source	Sector Expert	7	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔				
8	Air Pollution Monitoring and Control - Stationary Source	Sector Expert	7	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔			
9	Air Pollution Monitoring and Control - Stationary Source	Monitoring Specialist	6			✔	✔		✔	✔			✔	✔	✔			
10	Ambient Air Quality Monitoring	Monitoring Specialist	6			✔	✔	✔	✔	✔			✔	✔	✔			✔
11	Air Pollution Monitoring and Control - Mobile Source	Monitoring Specialist	6			✔	✔							✔	✔			
12	Air Pollution Monitoring and Control - Stationary Source	APCD Specialist	6			✔	✔		✔	✔	✔	✔	✔	✔				
13	Policy and Regulation	Specialist	6	✔	✔	✔	✔		✔	✔	✔	✔					✔	✔

S. No.	Sector/Sub-sector	Job Role	NSQF Level	MoEF&CC	Department of Environment in States/UTs	CPCB	SPCB/PCCs	ULB	IoR	Other Academic and Research Institutes	NGOs/Think Tanks	Consultants/ Consulting Firms	Air Polluting Industries	Air Pollution Monitoring and Control	Government/private Laboratories	Media	Financial Institution/ Economic Institutes	Health Agencies/Institutes
14	Economic/ Finance	Economist - AQM	6	✔	✔	✔	✔		✔	✔	✔	✔					✔	
15	Health	Health Specialist - AQM	6	✔	✔	✔	✔			✔	✔	✔						✔
16	Inventory, Modelling, and Forecasting	Data Portal Developer/ Coordinators	6			✔	✔		✔	✔	✔	✔						
17	Inventory, Modelling, and Forecasting	Specialist • Geo spatial Modelling • Air Quality Modelling • Receptor modelling • Economic Modelling	6			✔	✔		✔	✔	✔	✔						
18	Air Quality Planning	Specialist	6	✔	✔	✔	✔	✔	✔	✔	✔	✔						
19	Air Pollution Monitoring and Control - Mobile Source	Specialist	6	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔				
20	Air Pollution Monitoring and Control - Stationary Source	Specialist	6			✔	✔				✔	✔	✔	✔				
21	Air Pollution Monitoring and Control - Area Source	Specialist	6	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔					✔
22	Air Quality Management	Data Scientist	6	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
23	Air Quality Planning	Air Quality Manager - Urban	6					✔										
24	Air Quality Management	Communicator	6	✔	✔	✔	✔				✔		✔			✔	✔	✔
25	Audit, Inspection, and Enforcement	Air Quality Inspector/ Auditor	6			✔	✔					✔	✔					
26	Air Pollution Monitoring and Control - Stationary Source	Monitoring Manager	5			✔	✔						✔	✔	✔			
27	Ambient Air Quality Monitoring	Scientist/ Monitoring Manager	5			✔	✔	✔				✔	✔		✔			
28	Air Pollution Monitoring and Control - Mobile Source	Lab Scientist	5												✔			

S. No.	Sector/Sub-sector	Job Role	NSQF Level	MoEF&CC	Department of Environment in States/UTs	CPCB	SPCB/PCCs	ULB	IoR	Other Academic and Research Institutes	NGOs/Think Tanks	Consultants/ Consulting Firms	Air Polluting Industries	Air Pollution Monitoring and Control	Government/Private Laboratories	Media	Financial Institution/ Economic Institutes	Health Agencies/Institutes
29	Air Pollution Monitoring and Control - Stationary Source	Supervisor APCD	5										✔	✔				
30	Air Quality Management	Researcher/ Analyst	5	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
31	Air Quality Management	Data Analyst	5	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
32	Audit, Inspection, and Enforcement	Junior Inspector/ Auditor	5			✔	✔	✔				✔	✔					
33	Air Pollution Monitoring and Control - Area Source	Ward Supervisor	5					✔										
34	Air Pollution Monitoring and Control - Area Source	Field Supervisor	5						✔	✔	✔	✔						✔
35	Air Pollution Monitoring and Control - Stationary Source	APCD Technician	4										✔	✔				
36	Air Pollution Monitoring and Control - Stationary Source	Monitoring Technician	4										✔	✔				
37	Ambient Air Quality Monitoring	Field Technician (CAAQM, Manual)	4			✔	✔		✔			✔	✔	✔	✔			
38	Air Pollution Monitoring and Control - Stationary Source	Junior Lab Scientist	4												✔			
39	Air Pollution Monitoring and Control - Mobile Source	Junior Lab Scientist	4												✔			
40	Air Pollution Monitoring and Control - Stationary Source	Maintenance Assistant - APCD	3										✔	✔				
41	Air Pollution Monitoring and Control - Mobile Source	Operator-PUC Centre	3											✔				
42	Air Pollution Monitoring and Control - Area Source	Municipal Worker	2					✔										

4.3 Job roles and requirements

4.3.1 Air quality management – General

AQM-General has six job roles that are required in all organizations. Some of these job roles are entry-level (NSQF level five) and are very important to build a strong AQM sector.

Sl. No.	Job Role	NSQF Level
1.	Head of Govt. Department/Commissioner of ULB/CEO of Company and Organization	8
2.	Programme Head/Project Head/Department Head	8
3.	Data Scientist	6
4.	Communicator	6
5.	Researcher/Analyst	5
6.	Data Analyst	5

1. Head of govt. department/Commissioner of ULB/CEO of company and organization

Job Role: The people in this job role are the leaders of their respective organizations and drive its vision, plan, and programmes.

Organization	• Ministry of Environment, Forest and Climate Change • Urban Local Bodies • Department of Environment in States/UTs • Companies, NGOs, Think Tank, Consultancy
NSQF Level	8
Key Skills	Administration, Decision-making, Delegation, Diplomacy, Communication, Negotiating Skills, Strategic Planning, Stakeholder Management, and Leadership
Key Knowledge	• Basic knowledge about the social, economic, and environmental costs of poor air quality • Basic knowledge of air pollution policies, rules, and regulations • Basic knowledge of air pollution planning, monitoring, mitigation, and control from stationary, mobile, and area sources • Legal, financial, and institutional aspects of air quality management • Knowledge of best practices and cleaner/greener alternatives
Minimum Qualification	NA
Minimum Experience	NA
Training Programme	Bridge course – Induction course on AQM for the top management

2. Programme head/Project head/Department head

Job Role: Head of the AQM teams/projects/departments of various organizations. They require advanced training in specific topics to upgrade their skills.

Organization	• Institutes of Repute • Other Academic and Research Institutes • NGOs/Think Tanks • Consultants/Consulting Firms • Air Polluting Industries • Air Pollution Monitoring and Control Industry • Financial Institution/Economic Institutes/Health Agencies • Central Pollution Control Board • State Pollution Control Boards/Committees

NSQF Level	8
Key Skills	Administration, Communication, Conflict Resolution, Decision-making, Delegation, Leadership, Planning, Team Building, Work Ethics
Key Knowledge	• Advanced knowledge of air pollution science • Advanced knowledge of pollution management and mitigation • Latest developments in air quality domain • International best practices • Health impacts • Social and behavioural science • Air quality planning and implementation • Health, techno-economic, and social costs • Financing AQM • Legal and institutional framework
Minimum Qualification	NA
Minimum Experience	NA
Training Programme	They require multiple Advanced course on specialized topics

3. Data scientist

Job Role: Lead data scientist in an organization will be responsible for running the data science team and will be proficient in using scientific methods, processes, algorithms, and systems to extract knowledge and insights from structured and unstructured data.

Organization	Across all organizations
NSQF Level	6
Key Skills	Data Analysis, Problem Solving, Reasoning Skills, Research Skills, Communication and Presentation Skills
Key Knowledge	• Advanced statistics (Python, R, and other statistic tools) • Advanced mathematics and scientific concepts associated with air quality parameters • Advanced domain knowledge of air quality • Rules, regulations, and standards • Basics of inventory and modelling • Data visualization and presentation
Minimum Qualification	Bachelor's degree in technology, science, maths, or statistics
Minimum Experience	5 years
Training Programme	Short-term tailored training programme

4. Air pollution communicator

Job Role: A mid-level officer engaged in the communications department of an organization or a journalist with five years of experience. She/He will communicate the policy, plans, science, technology, health, economics, and other aspects of air pollution to the masses.

Organization	• Ministry of Environment, Forest and Climate Change • Department of Environment in States/UTs • Central Pollution Control Board • State Pollution Control Boards/Committees • NGOs/Think Tanks • Air Polluting Industries • Media

	• Financial Institution/Economic Institutes • Health Agencies/Institutes
NSQF Level	6
Key Skills	Writing Skills, Technical Reading, Data Analysis, Research, Communication and Presentation Skills
Key Knowledge	• Basic air quality domain knowledge • Rules, regulation, and compliance requirements • Health and economic impacts • International best practices • Basic pollution control and management techniques and technologies • Knowledge of social and behavioural science • Science communication • Basic data analysis and interpretation
Minimum Qualification	Bachelor's in Technology/Science/Social Science/Journalism/Communication
Minimum Experience	5 years
Training Programme	Short-term tailored training programme

5. Air pollution researcher/analyst

Job Role: This is the entry-level job for a researcher/analyst in the air pollution sector.

Organization	Across all organizations
NSQF Level	5
Key Skills	Analytical Skills, Critical Thinking, Data Analysis, Report Writing, Project Coordination, Research Skills
Key Knowledge	• Basic concepts in air pollution sciences • Basic concepts in characteristics of gases, particulates, and toxins • Mathematics for air pollution assessment and control • Environmental statistical techniques • Air pollution control methods and technologies • Basic knowledge of laws, rules, regulations, and standards • Basics of air quality monitoring technologies, including CEMS, CAAQMS, sensor-based technologies, and laboratory procedures • Basics of auditing, compliance, and enforcement • Health impacts • QA/QC methods • Sector-specific knowledge – agriculture/buildings/clean cooking/industrial operations/transport/urban area • Survey methods • Basics of air quality planning/airshed management • Social and behavioural science
Minimum Qualification	Bachelor of Technology or Master of Science
Minimum Experience	NA
Training Programme	Short-term NSQF aligned training programme

6. Data analyst

Job Role: This is the entry-level job for a data analyst/scientist in an organization.

Organization	Across all organizations
NSQF Level	5
Key Skills	Computer Skills, Analytical Skills, Critical Thinking, Research Skills, Writing Skills
Key Knowledge	• Basic statistics packages (Excel, R) • Basic mathematics and scientific concepts associated with air quality parameters • Basic air quality domain knowledge - causes, impacts, mitigation, and control technologies • Rules, regulations, and standards • Data visualization and presentation • Database management
Minimum Qualification	Bachelor of Technology or Master of Science
Minimum Experience	NA
Training Programme	Short-term NSQF aligned training programme

4.3.2 Air quality planning

S. No.	Job Role	NSQF Level
1	Sector Expert	7
2	Specialist	6
3	Air Quality Manager - Urban	6

1. Air quality planning expert

Job Role: Head of the air quality planning department in an organization. She/He will lead the team in developing national/state/district/city/sector-specific air quality plans.

Organization	• Ministry of Environment, Forest and Climate Change • Department of Environment in States/UTs • Central Pollution Control Board • State Pollution Control Boards/Committees • Institutes of Repute • Other Academic and Research Institutes • NGOs/Think Tanks • Consultants/Consulting Firms
NSQF Level	7
Key Skills	Logical Thinking, Stakeholder Engagement, Negotiation, Reasoning, Risk-management, Strategic Thinking Skills
Key Knowledge	• Inventory and source apportionment • Advanced data analytics and interpretation • Urban and environmental planning • Setting of local standards • Economics of air quality management • Financing air quality management

	• Project management • Health and environmental impacts • Development and evaluation of AQM action plans • Master plan evaluation and development • Legal and institutional knowledge of air quality
Minimum Qualification	Ph.D. in relevant subject
Minimum Experience	5 years
Training Programme	Advanced course on the subject

2. Air quality planning specialist

Job Role: Experts in a particular subject/sector of air quality planning.

Organization	• Ministry of Environment, Forest and Climate Change • Department of Environment in States/UTs • Central Pollution Control Board • State Pollution Control Boards/Committees • Urban Local Bodies • Institutes of Repute • Other Academic and Research Institutes • NGOs/Think Tanks • Consultants/Consulting Firms
NSQF Level	6
Key Skills	Analytical, Critical Thinking, Project Management, Reasoning, Research, Strategic Thinking Skills, Communication Skills
Key Knowledge	• Data analytics and interpretation • Airshed and delineation of source contribution • Sector-specific knowledge of management and control – agriculture/land/ buildings/clean cooking/economics/indoor air pollution/transport/urban area/ waste management/industries • Urban and environmental planning • Regulations and compliance • Health and environmental impacts • Development of airshed action plan/city action plan/regional action plan/state action plan • Legal and institutional knowledge of air quality • GIS, land, and land use planning • Green belt development • Primary survey – social, economic, and physical • Best practices
Minimum Qualification	Bachelor's degree in technology or science
Minimum Experience	5 years
Training Programme	They required multiple short-term tailored training programmes

3. Air quality manager

Job Role: Head of the air quality or environment department in a Municipal Corporation/Council.

Organization	Urban Local Bodies
NSQF Level	6
Key Skills	Critical Thinking, Data Analysis, Delegation, Emotional Intelligence, Networking, Reasoning, Research, Communication Skills
Key Knowledge	• Development of city action plan • Basic knowledge of air quality monitoring technologies • Air pollution inventory • Pollution control – construction, roads, and waste management • Rules, regulations, and by-laws • Skill to draft city by-laws • Inspection and compliance • Green belt development • Implementation and monitoring • Understanding of standard operating procedures
Minimum Qualification	Bachelor's degree in technology or science
Minimum Experience	5 years
Training Programme	Short-term NSQF aligned training programme

4.3.3 Policy and regulation

S. No.	Job Role	NSQF Level
1	Sector Expert	7
2	Specialist	6

1. Policy and regulation - expert

Job Role: Head of the policy/regulation department in an organization.

Organization	• Ministry of Environment, Forest and Climate Change • Department of Environment in States/UTs • Central Pollution Control Board • State Pollution Control Boards/Committees • Institutes of Repute • Other Academic and Research Institutes • NGOs/Think Tanks • Consultants/Consulting Firms • Financial Institution/Economic Institutes • Health Agencies/Institutes
NSQF Level	7
Key Skills	Collaboration, Decision Making, Logical Thinking, Managing Remote Teams, Multitasking, Negotiation, Planning, Problem Solving, Reasoning, Risk Management

Key Knowledge	• Up-to-date information about new developments in laws, regulations, and guidance pertaining to air quality management • Advanced knowledge of the policy/regulatory development process • Methodology to estimate costs (health, techno-economic, and social) • Policy/Regulation implementation • Cost/Benefit analysis • Knowledge of health effects and exposure to pollutants • Advanced knowledge in air quality management and control in various sectors • Best practices
Minimum Qualification	Master's degree from any field
Minimum Experience	15 years
Training Programme	Advanced course on the subject

2. Policy and regulation – specialist

Job Role: Expert in a particular sector/area in policy and regulation team of an organization.

Organization	• Ministry of Environment, Forest and Climate Change • Department of Environment in States/UTs • Central Pollution Control Board • State Pollution Control Boards/Committees • Institutes of Repute • Other Academic and Research Institutes • NGOs/Think Tanks • Consultants/Consulting Firms • Air Polluting Industries • Financial Institution/Economic Institutes • Health Agencies/Institutes
NSQF Level	6
Key Skills	Advocacy, Coordination, Critical Thinking, Data Analysis, Logical Thinking, Networking, Reasoning, Research, Work Ethics, Communication Skills
Key Knowledge	• Air quality domain knowledge – types of emission sources and management and control measures in air quality planning and regulation development • Knowledge of ambient standards as well as specific emission standards for various emission sources and the relation between the two • Basics of air quality monitoring • Compliance and enforcement requirements • Environmental auditing • Cost for implementing regulations • Legal and institutional knowledge • Policy and regulation development and adoption procedures
Minimum Qualification	Bachelor's degree in technology or planning, or Master's degree in science
Minimum Experience	5 years
Training Programme	Short-term tailored training programme

4.3.4 Inventory, modelling, and forecasting

S. No.	Job Role	NSQF Level
1	Coordinator	6
2	Specialist	6

1. Coordinator

Job Role: Head of the inventory, modelling and forecasting team/project.

Organization	• Central Pollution Control Board • State Pollution Control Boards/Committees • Institutes of Repute • Other Academic and Research Institutes • NGOs/Think Tanks • Consultants/Consulting Firms
NSQF Level	6
Key Skills	Coordination, Critical Thinking, Data Analysis, Innovative, Research, Communication and Presentation
Key Knowledge	• Advanced statistics • Scientific concepts, including aerosol science • Air pollution meteorology • Development, use, and limitations of emission factors • Source sampling for pollutants • Development of inventories, including fine particulate emission inventories • Site-specific or area-activity data collation and analysis for estimating emissions • Estimates of mobile source emissions using models • Source apportionment • Air pollution dispersion models • Receptor modelling • QA/QC in air pollution modelling • Air quality domain knowledge • Air quality monitoring technologies • Air pollution laws, rules, and regulations
Minimum Qualification	Bachelor of Technology/Master of Science
Minimum Experience	5 years
Training Programme	Short-term tailored training programme

2. Specialist

Job Role: Expert in a particular area, such as inventory development, dispersion models, receptor models, mobile pollution modelling, geo-spatial modelling, economic modelling etc.

Organization	• Central Pollution Control Board • State Pollution Control Boards/Committees • Institutes of Repute (IoRs) • Other Academic and Research Institutes • NGOs/Think Tanks • Consultants/Consulting Firms
NSQF Level	6

Key Skills	Coordination, Critical Thinking, Data Analysis, Innovative, Research, Communication and Presentation
Key Knowledge	1. Key knowledge of coordinator 2. Specialization in: • Inventory development • Dispersion models • Receptor models • Mobile pollution modelling • Geo-spatial modelling • Economic modelling
Minimum Qualification	Bachelor's degree in technology, science, maths, or statistics
Minimum Experience	5 years
Training Programme	Multiple short-term tailored training programme

4.3.5 Health

S. No.	Sector/Sub-sector	Job Role	NSQF Level
1	Health	Health Specialist - AQM	6

1. Health specialist – AQM

Job Role: A senior analyst working on health impacts of air pollution and providing inputs for policies, plans, regulations, and solutions.

Organization	• Ministry of Environment, Forest and Climate Change • Department of Environment in States/UTs • Central Pollution Control Board • State Pollution Control Boards/Committees • Other Academic and Research Institutes • NGOs/Think Tanks • Consultants/Consulting Firms • Air Polluting Industries • Health Agencies/Institutes
NSQF Level	6
Key Skills	Analysis, Coordination, Critical Thinking, Data Analysis, Research Skills, Communication and Presentation Skills
Key Knowledge	• Air quality monitoring technologies (ambient & indoors) • Sector-specific knowledge of health impacts from indoor air pollution, ambient air pollution, industrial, fugitive and hazardous emissions • Epidemiologic methods and techniques • Basics of laws, rules, and regulations • Basic sector-specific knowledge of mitigation and control technologies
Minimum Qualification	Master's degree in public health or epidemiology
Minimum Experience	5 years
Training Programme	Short-term tailored training programme

4.3.6 Economics and finance

S. No.	Job Role	NSQF Level
1	Economic Specialist - AQM	6

1. Economic specialist - AQM

Job Role: A senior analyst working on economic and financial aspects of air pollution and providing inputs for policies, plans, regulations, and solutions.

Organization	• Ministry of Environment, Forest and Climate Change • Department of Environment in States/UTs • Central Pollution Control Board • State Pollution Control Boards/Committees • Institutes of Repute • Other Academic and Research Institutes • NGOs/Think Tanks • Consultants/Consulting Firms • Financial Institution/Economic Institutes
NSQF Level	6
Key Skills	Analysis, Reasoning, Strategic Thinking Skills, Research Skills, Communication Skills
Key Knowledge	• Micro/Macroeconomics related to air quality • Econometrics • Project financing • Public finance • Valuation of impacts • Cost-benefit analysis • Basic knowledge in AQM domain
Minimum Qualification	Master's degree in economics or related field
Minimum Experience	5 years
Training Programme	Short-term tailored training programme

4.3.7 Audit, inspection, and enforcement

S. No.	Job Role	NSQF Level
1	Regional Air Quality Manager/Senior Regulator/Senior Auditor/Chief Environment Manager	7
2	Air Quality Inspector/Auditor	6
3	Junior Inspector/Auditor	5

1. Regional air quality manager/Senior regulator/Senior auditor/Chief environment manager

Job Role: Head of the air quality regulation in CPCB/SPCBs, head of the environment department in an industry, head of the air pollution audit team in a consultancy.

Organization	• Ministry of Environment, Forest and Climate Change • Department of Environment in States/UTs • Central Pollution Control Board/State Pollution Control Boards • Consultants/Consulting Firms • Air Polluting Industries
NSQF Level	7
Key Skills	Conflict Management, Decision-making, Multitasking, Planning, Problem Solving, Reasoning, Communication and Presentation Skills
Key Knowledge	• Detailed understanding of specific gaseous and particulate control device operations and key elements affecting performance • Detailed understanding of fugitive and area emissions and their specific mitigation actions • Detailed understanding of the modelling results and use for regulatory actions • Inspection, compliance, and enforcement of area/sector-specific action plans • Drafting of regulatory conditions and requirements • Environmental audit • Understanding of emissions calculations concepts and the ability to use data for development of emission factors • Development of best available technology (BAT) documents
Minimum Qualification	Master's degree in science or technology
Minimum Experience	15 years
Training Programme	Advanced course on the subject

2. Air quality inspector/auditor

Job Role: Mid-level air pollution regulator in CPCB/SPCBs, mid-level auditor in consultancy, or environment manager in industry.

Organization	• Central Pollution Control Board • State Pollution Control Boards/Committees • Consultants/Consulting Firms • Air Polluting Industries
NSQF Level	6
Key Skills	Conflict Management, Decision-making, Multitasking, Planning, Problem Solving, Reasoning, Communication and Presentation Skills
Key Knowledge	• Inspection, compliance, and enforcement rules and procedures • Advanced knowledge of air pollution control technologies • Advanced knowledge of air quality monitoring technologies (stationary/area) • Legal and institutional knowledge of air quality domain • Environmental auditing • Occupational health and safety • Basic knowledge of inventory and air quality planning • Ability to undertake independent compliance and enforcement actions • Dealing with courts and NGT • Development of industry-specific regulatory requirements
Minimum Qualification	Bachelor of Technology/Master of Science
Minimum Experience	5 years
Training Programme	Short-term tailored training programme

3. Junior air quality inspector/auditor

Job Role: Entry-level job as an air pollution regulator in CPCB/SPCBs, auditor in consultancy, or environment professional in industry.

Organization	• Central Pollution Control Board • State Pollution Control Boards/Committees • Urban Local Bodies • Consultants/Consulting Firms • Air Polluting Industries
NSQF Level	5
Key Skills	Research Skills, Critical Thinking, Report Writing, Work Ethics, Data Analysis, Communication and Presentation Skills
Key Knowledge	• Understanding of science and mathematical concepts related to air quality • Understanding of health and economic impacts • Basic knowledge of air pollution control technologies • Knowledge of air quality monitoring technologies • Laboratory procedures for sampling, testing, and report writing • Air quality inspection procedure • Data collection, collation, and interpretation • Laws, rules, and regulations • Understanding of SOPs (standard operating procedures) for conducting audit/ inspection/sampling and report writing
Minimum Qualification	Bachelor of Technology
Minimum Experience	NA
Training Programme	Short-term NSQF aligned training programme

4.3.8 Ambient air quality monitoring

S. No.	Job Role	NSQF Level
1	Monitoring Specialist	6
2	Scientist/Monitoring Manager	5
3	Field Technician	4

1. AAQ monitoring specialist

Job Role: Head of the AAQ monitoring department in CPCB/SPCBs, laboratories, and industry or head of the AAQ research team in academic and research institutes.

Organization	• Central Pollution Control Board • State Pollution Control Boards/Committees • Industry • Institutes of Repute • Academic and Research Institutes • Govt./Private Laboratories
NSQF Level	6
Key Skills	Leadership, Problem Solving, Coordination, Communication skills

Key Knowledge	• Ability to evaluate and assess ambient monitoring data for quality, trends, source impacts, and attainment status • Analysis methods, QC requirements, modes of failure, statistical tools, and use of external data for validation • Aerosol science and atmospheric chemistry • Protocols for monitoring siting and constraints applicable to monitoring siting • Ability to troubleshoot operational, calibration, and network design problems • Long-term equipment and network upgrades/design changes • Standard operating procedures for methods, instruments, and sampling methods for air sampling • Current criteria pollutant monitoring methods and instruments • Air toxics sampling and analytical methods • State of the art monitoring technology and technical advances • Relevant regulations and compliance requirements • Advanced knowledge of ambient air pollution chemistry, transport, and statistical analysis methods • Techno- commercial understanding of technologies • Advanced knowledge of QA/QC principles and procedures • Site Survey and GIS
Minimum Qualification	Bachelor of Technology/Master of Science
Minimum Experience	5 years
Training Programme	Short-term tailored training programme

2. AAQ monitoring manager/scientist

Job Role: Regional manager of the ambient air quality monitoring labs of CPCB/SPCBs, govt./private laboratories, and industry or senior scientist in the ambient air quality research team in academic and research institutes

Organization	• Central Pollution Control Board • State Pollution Control Boards/Committees • Industry • Institutes of Repute • Academic and Research Institutes • Govt./Private Laboratories
NSQF Level	5
Key Skills	Basic Statistics, Research Skills, Communication Skills, Presentation Skills
Key Knowledge	• Basic mathematical and scientific concepts associated with ambient monitoring • Analytical methods for analysis of each pollutant • Principles of monitoring and sampling methods • QA/QC procedures for ambient air monitoring, sampling, and analysis • Relevant regulation and protocols for monitoring siting • Data validation and data analysis methods • Handling of ambient samples and appropriate data analysis to evaluate sample results • Air quality monitoring technologies, including components of air quality monitoring devices • O&M of instruments including calibration • Compliance requirements • Data interpretation, data logging

	• Occupational health and safety • Performance evaluation of instruments • Regulation on air quality
Minimum Qualification	Bachelor of Technology/Master of Science
Minimum Experience	3 years
Training Programme	Short-term NSQF aligned training programme

3. AAQ field technician (CAAQM & Manual)

Job Role: A person who is in charge of the day-to-day operations of the AAQ monitoring station.

Organization	• Central Pollution Control Board • State Pollution Control Boards/Committees • Industry • Institutes of Repute (IoRs) • Academic and Research Institutes • Govt./Private Laboratories • Urban Local Bodies
NSQF Level	4
Key Skills	Basic Maths and Statistics, Basic Report Writing Skills, Problem Solving, Work Ethics
Key Knowledge	• Basics of AAQ monitoring techniques • Basics of AAQ monitoring devices – automatic and manual monitors • QA/QC procedures for ambient air monitoring, sampling, and analysis • Technical understanding of components of devices • Operation and maintenance of devices • Sampling procedure • Data recording and management • Basics of regulation • Occupational health and safety
Minimum Qualification	Diploma in Technology or equivalent
Minimum Experience	NA
Training Programme	NSQF aligned courses

4.3.9 Air pollution monitoring and control – area source

S. No.	Job Role	NSQF Level
1	Sector Expert	7
2	Specialist	6
3	Field Supervisor	5
4	Ward Supervisor - Urban	5
5	Municipal Worker	2

1. Sector expert

Job Role: An expert in air quality management for area sources. She/He will head the department/program/project for mitigating pollution from area sources.

Organization	• Ministry of Environment, Forest and Climate Change • Department of Environment in States/UTs • Central Pollution Control Board • State Pollution Control Boards/Committees • Urban Local Bodies • Institutes of Repute • Other Academic & Research Institutes • NGOs/Think Tanks • Consultants/Consulting Firms • Air Pollution Monitoring & Control Industries
NSQF Level	7
Key Skills	Communication Skills, Logical Thinking, Negotiation, Problem Solving, Reasoning, Risk Management, Strategic Thinking Skills
Key Knowledge	• In-depth understanding of AQM management techniques for area sources • Local air quality issues • Sector-specific knowledge – agriculture/land/biomass/waste management/construction/roads/transport • Social and behavioural science • Compliance requirements for area sources • International best practices • Ability to evaluate city/sector action plan on area sources • Development of regulatory conditions for area sources • Social mobilization programmes • Cost-benefit analysis related to area sources
Minimum Qualification	M.Tech. or Ph.D. in relevant fields
Minimum Experience	10 years
Training Programme	Advanced course on the subject

2. Specialist

Job Role: A mid-level officer with an expertise in certain areas/sectors of managing air quality from area sources.

Organization	• Ministry of Environment, Forest and Climate Change • Department of Environment in States/UTs • Central Pollution Control Board • State Pollution Control Boards/Committees • Urban Local Bodies • Institutes of Repute • Other Academic and Research Institutes • NGOs/Think Tanks • Consultants/Consulting Firms • Health Agencies/Institutes
NSQF Level	6

Key Skills	Communication Skills, Logical Thinking, Negotiation, Problem Solving, Reasoning, Risk Management, Strategic Thinking Skills
Key Knowledge	• AQM management techniques for area sources • Sector-specific knowledge (agriculture/land/biomass/waste management/ construction/roads/transport) • Compliance requirements for area sources • Ability to develop city/sector action plan for area sources • Inspection and enforcement of regulatory conditions for area sources • Laws, rules, and regulations related to area sources
Minimum Qualification	Bachelor of Technology
Minimum Experience	5 years
Training Programme	Short-term tailored training programme

3. Field supervisor

Job Role: A person engaged in field research and engaging/organizing communities to mitigate pollution from area sources.

Organization	• Institutes of Repute • Other Academic and Research Institutes • NGOs/Think Tanks • Consultants/Consulting Firms • Health Agencies/Institutes
NSQF Level	5
Key Skills	Communication Skills, Research Skills, Stakeholder Management, Survey Skills, Coordination
Key Knowledge	• Project management • Social mobilization • Survey techniques • Basic data analysis • Basic domain knowledge in AQM sector • Basic Sector-specific knowledge – agriculture/clean cooking/industrial operations/ transport/waste management
Minimum Qualification	Bachelor's degree in any subject
Minimum Experience	NA
Training Programme	Short-term NSQF aligned training programme

4. Ward supervisor

Job Role: Head of the municipal services in a ward in an urban local body. She/He is responsible for garbage management, road sweeping, maintenance of parks/green belt, plantation etc. in a municipal ward.

Organization	Urban Local Bodies
NSQF Level	5
Key Skills	Communication, Cooperation, Emotional Intelligence, Logical Thinking, Work Ethics

Key Knowledge	• Basic knowledge of air quality domain • Techniques and technologies to manage dust, waste management, plantation, etc. • Rules and regulations pertaining to AQM in urban areas • Inspection and enforcement procedures • Development of action plan at the ward level (micro-planning) • Ability to record and interpret air quality monitoring data
Minimum Qualification	Bachelor's degree in any subject
Minimum Experience	2 years
Training Programme	Short-term NSQF aligned training programme

5. Municipal worker

Job Role: A worker employed in a urban local body, formally or on contract, and engaged in garbage management, road sweeping, plantation, and maintenance of green spaces.

Organization	Urban Local Bodies
NSQF Level	2
Key Skills	Communication, Cooperation, Hard Work, Punctuality, Team Player
Key Knowledge	• Basic knowledge of air quality issues • Ability to understand and comprehend guidelines • Best practices in reducing dust, stopping burning of garbage, plantation and maintenance of green areas
Minimum Qualification	10th standard
Minimum Experience	2 years
Training Programme	Short-term NSQF aligned training programme

4.3.10 Air pollution monitoring and control – mobile source

S. No.	Job Role	NSQF Level
1	Sector Expert	7
2	Monitoring Specialist	6
3	Specialist	6
4	Scientist	5
5	Junior Lab Scientist	4
6	Operator-PUC Centre	3

1. Sector expert

Job Role: An expert in air quality management for mobile sources. She/He will head the department/program/project for mitigating pollution from mobile sources.

Organization	• Ministry of Environment, Forest and Climate Change • Department of Environment in States/UTs • Central Pollution Control Board • State Pollution Control Boards/Committees

	• Urban Local Bodies • Institutes of Repute • Other Academic and Research Institutes • NGOs/Think Tanks • Consultants/Consulting Firms • Air Pollution Monitoring and Control
NSQF Level	7
Key Skills	Logical Thinking, Problem Solving, Reasoning, Risk Management, Strategic Thinking Skills, Communication, Presentation
Key Knowledge	• Advanced knowledge of AQM sector • In-depth understanding of AQM technologies for mobile sources • Compliance requirements for mobile sources • Transport planning and management, including NMT and public transport • Traffic management and road design and planning • Social and economic assessment in transport sector • Planning for alternate technologies – EVs, Hydrogen • Economic and fiscal tools and techniques • Evaluation of city action plans • Emerging best practices
Minimum Qualification	Bachelor of Technology/Planning/Science
Minimum Experience	10 years
Training Programme	Advanced course on the subject

2. Monitoring specialist

Job Role: An expert in pollution monitoring from mobile sources. She/He will head the automobile pollution monitoring laboratory.

Organization	• Central Pollution Control Board • State Pollution Control Boards/Committees • Air Pollution Monitoring and Control • Government/Private Laboratories
NSQF Level	6
Key Skills	Advanced Statistics, Leadership, Problem Solving
Key Knowledge	• Analysis methods, QC requirements, modes of failure, statistical tools, and use of external data for validation • Protocols for monitoring and constraints applicable to monitoring • Ability to troubleshoot operational, calibration, and network design problems • Standard operating procedures for methods, instruments, and sampling methods • Understand current criteria pollutant monitoring methods and instruments • Relevant regulations and compliance requirements • Advanced knowledge of QA/QC principles and procedures
Minimum Qualification	Bachelor of Technology/Master of Science
Minimum Experience	5 years
Training Programme	Short-term tailored training programme

3. Specialist

Job Role: A mid-level officer with an expertise in certain areas/sectors of managing air quality from mobile sources such as automobile technology, transport planning, public transport, etc.

Organization	• Ministry of Environment, Forest and Climate Change • Department of Environment in States/UTs • Central Pollution Control Board • State Pollution Control Boards/Committees • Institutes of Repute • Other Academic and Research Institutes • NGOs/Think Tanks • Consultants/Consulting Firms • Air Polluting Industries • Air Pollution Monitoring and Control
NSQF Level	6
Key Skills	Logical Thinking, Problem Solving, Reasoning, Risk Management, Strategic Thinking Skills, Communication, Presentation
Key Knowledge	• Knowledge of AQM sector • Pollution control technologies for mobile sources • Compliance requirements for mobile sources • Transport planning and management, including NMT and public transport • Traffic management, road design, and planning • Social and economic assessment in transport sector • Planning for alternate technologies – EVs, Hydrogen • Development of city action plans
Minimum Qualification	Bachelor of Technology
Minimum Experience	5 years
Training Programme	Short-term tailored training programme

4. Scientist

Job Role: A mid-level scientist working on mobile pollution in a laboratory.

Organization	Government/Private Laboratories
NSQF Level	5
Key Skills	Analysis, Analytical, Attention to Detail, Research, Strategic Thinking Skills, Work Ethics
Key Knowledge	• Calibration of monitoring instruments • Understanding of compliance requirements • Laboratory procedures for sampling, handling, testing, and data recording • Understanding of health impacts • Understanding of SOPs (standard operating procedures) for various kinds of monitoring equipment
Minimum Qualification	Bachelor of Technology
Minimum Experience	NA
Training Programme	Short-term NSQF aligned training programme

5. Junior lab scientist

Job Role: Entry-level job as a scientist in mobile pollution monitoring laboratory.

Organization	Government/Private Laboratories
NSQF Level	4
Key Skills	Analysis, Analytical, Attention to Detail, Computer Literacy, Research, Strategic Thinking Skills, Work Ethics
Key Knowledge	• Basic mathematical and scientific concepts associated with mobile monitoring • Analytical methods for analysis of pollutants • Principles of monitoring and sampling methods • QA/QC procedures for monitoring, sampling, and analysis • O&M of instruments including calibration • Compliance requirements • Data logging • Occupational health and safety • Regulation on air quality
Minimum Qualification	Diploma in Laboratory Procedures or equivalent
Minimum Experience	NA
Training Programme	NSQF level aligned course

6. Operator-PUC centre

Job Role: A person who is in charge of the day-to-day operations of a PUC centre.

Organization	Air Pollution Monitoring and Control
NSQF Level	3
Key Skills	Data Entry, Data Management, Work Ethics
Key Knowledge	• Technical knowledge for operating PUC devices • Basic understanding of air pollution • Understanding of health impacts • Understanding of inspection procedure
Minimum Qualification	10+2 or equivalent
Minimum Experience	NA
Training Programme	NSQF level aligned courses

4.3.11 Air pollution monitoring and control – stationary source

S. No.	Job Role	NSQF Level
1	Sector Expert	7
2	Monitoring Specialist	6
3	APCD Specialist	6
4	Specialist	6
5	Monitoring Manager	5
6	Supervisor APCD (Including O & M)	5
7	APCD Technician (Including O & M)	4
8	Monitoring Technician	4
9	Junior Lab Scientist	4
10	Maintenance Assistant - APCD (Including O & M)	3

1. Sector expert

Job Role: An expert in air quality management for stationary sources. She/He will head the department/ program/project for the mitigation of pollution from stationary sources.

Organization	• Ministry of Environment, Forest and Climate Change • Department of Environment in States/UTs • Central Pollution Control Board • State Pollution Control Boards/Committees • Institutes of Repute • Other Academic and Research Institutes • NGOs/Think Tanks • Consultants/Consulting Firms • Air Polluting Industries • Air Pollution Monitoring and Control • Government/Private Laboratories
NSQF Level	7
Key Skills	Communication Skills, Logical Thinking, Negotiation, Problem Solving, Reasoning, Risk Management, Team Building
Key Knowledge	• Air quality monitoring technologies (including CEMS) • In-depth knowledge of industrial processes and controls • In-depth knowledge of pollution control technologies • Industrial area planning • Economics of mitigation and control • Compliance and enforcement • Technology assessment • Environmental audit • International best practices
Minimum Qualification	Master of Technology
Minimum Experience	10 years
Training Programme	Advanced course on the subject

2. Monitoring specialist

Job Role: An expert in pollution monitoring from stationary sources. She/He will be the head of the pollution monitoring department dealing with stack monitoring.

Organization	• Central Pollution Control Board • State Pollution Control Boards/Committees • Institutes of Repute • Other Academic and Research Institutes • Air Polluting Industries • Air Pollution Monitoring and Control • Government/Private Laboratories
NSQF Level	6
Key Skills	Analytical Skills, Communication Skills, Critical Thinking, Data Analysis, Reasoning, Work Ethics
Key Knowledge	• Scientific understanding of particulate and gaseous emissions • Ability to select air quality monitoring techniques and technologies (including particulate and gaseous CEMS) • Calibration of monitoring instruments • Legal and compliance requirements • Understanding of industrial processes • Sampling methods and laboratory procedures • Occupational health and safety • QA/QC processes
Minimum Qualification	Bachelor of Technology
Minimum Experience	5 years
Training Programme	Short-term tailored training programme

3. Air pollution control device specialist

Job Role: An expert in design, construction, and operation of air pollution control devices. She/He can be the chief technical officer in the air pollution monitoring and control industry, chief design engineer in an industry, chief technologist in CPCB/SPCBs, or a senior scientist in academic and research institutes.

Organization	• Central Pollution Control Board • State Pollution Control Boards/Committees • Institutes of Repute • Other Academic and Research Institutes • NGOs/Think Tanks • Consultants/Consulting Firms • Air Polluting Industries • Air Pollution Monitoring and Control
NSQF Level	6
Key Skills	Critical Thinking, Presentation, Problem Solving, Project Management, Research, Risk Management, Communication Skills
Key Knowledge	• Design and optimization of APCD • O&M of APCD • Technical/Commercial assessment of technologies • Knowledge of BAT • Compliance requirements for air polluting industries
Minimum Qualification	Bachelor of Technology
Minimum Experience	5 years
Training Programme	Short-term tailored training programme

4. Specialist

Job Role: A mid-level officer with an expertise in managing air quality from certain industrial sectors such as chemicals, thermal power, steel, cement etc. or control of certain pollutants from industries such as air toxins.

Organization	• Central Pollution Control Boards • State Pollution Control Boards/Committees • NGOs/Think Tanks • Consultants/Consulting firms • Air Polluting Industries • Air Pollution Monitoring and Control
NSQF level	6
Key Skills	Data Analysis, Delegation, Innovative, Reasoning, Work Ethics
Key Knowledge	• Basic knowledge of air quality monitoring technologies (including CEMS) • In-depth knowledge of industrial processes and controls • In-depth knowledge of pollution control technologies • Industrial area planning • Economics of mitigation and control • Compliance and enforcement • Technology assessment • Environmental audit • International best practices
Minimum Qualification	Bachelor of Technology
Minimum Experience	5 years
Training Programme	Short-term tailored training programme

5. Monitoring Manager

Job Role: A mid-level officer/scientist working in a laboratory to measure the pollution from industries. She/He can also be the incharge for a laboratory in a big organization.

Organization	• Central Pollution Control Board • State Pollution Control Boards/Committees • Air Polluting Industries • Air Pollution Monitoring and Control • Government/Private Laboratories
NSQF Level	5
Key Skills	Analysis, Attention to Detail, Cooperation, Critical Thinking, Data Analysis, Innovative
Key Knowledge	• Basic air quality domain knowledge • Understanding of air quality monitoring technologies and its components • Calibration of monitoring instruments • O&M of monitoring equipments • Laboratory processes and procedures • Compliance requirements • Occupational health and safety
Minimum Qualification	Bachelor of Technology/Master of Science
Minimum Experience	NA
Training Programme	Short-term NSQF aligned training programme

6. Supervisor air pollution control device

Job Role: An on-field position for supervising the construction, operation, and maintenance of air pollution control devices. She/He can have an expertise in certain devices such as ESP, bag filter etc. or industrial sectors.

Organization	• Air Polluting Industries • Air Pollution Monitoring and Control
NSQF Level	5
Key Skills	Attention to Detail, Critical Thinking, Data Analysis, Innovative, Work Ethics, Data Logging
Key Knowledge	• In-depth knowledge of components of air pollution control technologies & its installation • In-depth knowledge of O&M of APCD, including preventive maintenance • SOP of APCD operations • Understanding of industrial process • Occupational health and safety
Minimum Qualification	Bachelor of Technology
Minimum Experience	5 years
Training Programme	Short-term NSQF aligned training programme

7. Air pollution control device technician

Job Role: An on-field position for undertaking the operations and maintenance of air pollution control devices.

Organization	• Air Polluting Industries • Air Pollution Monitoring and Control
NSQF Level	4
Key Skills	Basic Technical Literacy, Basic Computer Literacy, Work Ethics
Key Knowledge	• In-depth knowledge in working of any APCD (ESP, bag filter, FGD, NOx control etc.) • In-depth knowledge in O&M of any APCD (ESP, bag filter, FGD, NOx control etc.) • Knowledge of preventive maintenance • Data logging • Occupational health and safety • SOPs of APCD operations
Minimum Qualification	ITI or equivalent
Minimum Experience	2 years
Training Programme	NSQF aligned courses

8. Monitoring technician

Job Role: A person who is incharge of conducting stack monitoring in industries.

Organization	• Air Polluting Industries • Air Pollution Monitoring and Control
NSQF Level	4
Key Skills	Attention to Detail, Work Ethics, Coordination
Key Knowledge	• Basic knowledge of air pollutants • Basic knowledge of sampling • Understanding of laboratory SOPs • Monitoring equipment calibration • Data collection
Minimum Qualification	ITI or equivalent
Minimum Experience	2 years
Training Programme	NSQF aligned courses

9. Junior lab scientist

Job Role: Entry-level position for a scientist in an air pollution laboratory and stack monitoring.

Organization	• Government/Private Laboratories
NSQF Level	4
Key Skills	Analysis, Analytical, Attention to Detail, Computer Literacy, Work Ethics
Key Knowledge	• Basic mathematical and scientific concepts for testing of samples • Analytical methods for analysis of each pollutants • Principles of monitoring and sampling methods • QA/AC procedures for ambient air monitoring, sampling, and analysis • Relevant regulation and protocols for monitoring siting • Data validation and data analysis methods • Handling of ambient samples and appropriate data analysis to evaluate sample results • Air quality monitoring technologies including components of air quality monitoring devices
Minimum Qualification	Bachelor of Technology (Chemistry/Environment), Bachelor of Science, or equivalent
Minimum Experience	NA
Training Programme	NSQF aligned courses

10. Maintenance assistant – air pollution control device

Job Role: Entry-level position for operation and maintenance of air pollution control devices in industries.

Organization	• Air Polluting Industries • Air Pollution Monitoring and Control
NSQF Level	3
Key Skills	Active Listening, Attention, Dedication, Work Ethics
Key Knowledge	• Technical knowledge of operation of APCD • Maintenance schedule • Basic understanding of air pollution • Occupational health and safety
Minimum Qualification	10+2 or equivalent
Minimum Experience	NA
Training Programme	NSQF aligned courses

4.4 Organizations and jobs

For developing a national capacity-development programme, it is essential to identify the number of organizations linked with the AQM sector and estimate the number of present jobs and project the number of potential jobs in the future that require training.

Presently in India, there are very few air pollution-specific jobs. Most jobs are advertised as general environment-related jobs with some responsibilities mentioned for air quality management. In our analysis of different job portals in India and the US, we found that advertisements in the US are very specific to the AQM sector, while in India, they are general using terms like environment, health and safety, operation and maintenance, etc. Therefore, it is impossible to estimate the actual number of people currently working in the sector, other than those working in visible jobs like the PUC centres (for tailpipe monitoring) or air pollution laboratories. However, based on expert opinion, an attempt has been made to project the number of jobs required to meet the NCAP/NMCA goals.

4.4.1 Number of organizations

There are at least 2,80,233 organizations and industries directly linked with the AQM sector. A majority of them are air polluting industries, followed by PUC centres, and ULBs.

Table 7: Category-wise number of organizations

S.No.	Name/Type	No. of Organizations
1	Central Government Ministries	9
2	Departments of State/UT Governments	324
3	Central Pollution Control Board & its Regional Directorates	11
4	State Pollution Control Boards/Pollution Control Committees & their District Offices	235
5.1	Municipal Corporation	206
5.2	Municipal Council	1,683
5.3	Nagar Panchayat	2,411
6	Institutes of Repute	82
7	Academic and Research Institutes (Excluding IORs)	150
8	NGOs/Think Tanks (Excluding IORs)	100
9	Consulting Firms	500
10.1	Large Air Polluting Industries (Including 17 Categories of Highly Polluting Industries)	4,700
10.2	Other Air Polluting Industries	1,01,285
10.3	Brick Kilns & Stone Crushers	1,12,000
10.4	Large Mines	3,886
11.1	Air Pollution Monitoring and Control Industry	200
11.2	PUC Centres	51,777
12	Government/Private Laboratories	524
13	Media	100
14	Financial/Economic Institutes	25
15	Health Agencies/Institutes	25
Total		**2,80,233**

Note: The number of media, academic & research institutes, NGOs/think tanks, consulting firms, finance/economic institutes, and health agencies/institutes mentioned here is a target number for organizations to be trained under the proposed National Programme. The total the number of these organizations are much higher. For example, every engineering college teaching civil and environmental engineering can be considered as working on air pollution management as they have a basic lab and teach air pollution control. There are about 3300 civil engineering colleges in India. Similarly, there are more than 1000 media houses in India.

4.4.2 Number of jobs

The total number of jobs required to adequately implement the NCAP/NMCA is estimated at 2.02 million (see Annexure 3). A large majority of these jobs are indirect jobs (1.55 million); direct jobs are about 0.47 million. About 1.55 million of the total jobs, mostly indirect, are in ULBs. The second-largest number of jobs are in air polluting industries (3,76,000) and air pollution monitoring and control industry (56,896). The number of jobs in central government ministries, state government departments, and pollution control boards amounts to about 10,000.

Most indirect jobs already exist, like the municipal workers engaged in garbage management, road sweeping, plantation, and maintenance of green spaces. But these workers have never been trained in their role in managing air pollution in cities. Similarly, some direct jobs, like that of the PUC operator checking tailpipes of vehicles, already exist. But they have not been provided formal training.

Many jobs, mostly direct jobs, do not exist currently, such as in ministries, departments, pollution control boards, research institutions, and consultancy firms. Similarly, a large number of new jobs will be required in the industries and mines.

Table 8: Number of jobs in different organizations

Type	Number of Jobs
Central Ministries	384
State Departments	3,744
Central & State Pollution Control Boards	5,903
Urban Local Bodies	15,48,244
Institutes of Repute	2,421
Academic and Research Institutes	3,225
NGOs/Think Tanks	1,510
Consulting Firms	16,100
Air Polluting Industries & Mines	3,75,860
Air Polluting Monitoring & Control Industry	56,896
Air Pollution Laboratories	7,182
Financial & Economic Institutes	338
Health Institutes	513
Total	**20,22,319**

Note: Number of jobs does not mean number of full-time jobs. There are many jobs where an employee may have far greater responsibilities in other areas than AQM.

Nearly 90 per cent of these jobs are at NSQF levels two, three and four. These are supervisors, technicians, and workers working in fields and factories but have never been made aware of their role or responsibilities or trained in AQM. Thus, the biggest problem in India's AQM sector is that people working in indirect jobs are not trained, and many required direct jobs do not exist.

Table 9: Number of jobs at different NSQF levels

NSQF Level	Number of Jobs
8	23,606
7	12,014
6	50,310
5	1,27,158
4	1,03,291
3	2,06,562
2	15,00,000
Total	**20,22,319**

Table 10: Number of jobs at different job roles

Sector/Sub-sector	Job Role	NSQF Level	No. of Jobs
Air Quality Management – General	Head of Govt. Department/ Commissioner of ULB/CEO of Company	8	12,740
Air Quality Management – General	Programme Head/Project Head/ Department Head	8	10,866
Air Quality Planning	Sector Expert	7	432
Audit, Inspection and Enforcement	Regional Air Quality Manager/Senior Regulator/Senior Auditor/Chief Environment Manager	7	4,014
Policy and Regulation	Sector Expert	7	865
Air Pollution Monitoring and Control – Mobile Source	Sector Expert	7	1,357
Air Pollution Monitoring and Control – Area Source	Sector Expert	7	4,496
Air Pollution Monitoring and Control – Stationary Source	Sector Expert	7	849
Air Pollution Monitoring and Control – Stationary Source	Monitoring Specialist	6	1,720
Ambient Air Quality Monitoring	Monitoring Specialist	6	1,764
Air Pollution Monitoring and Control – Mobile Source	Monitoring Specialist	6	56
Air Pollution Monitoring and Control – Stationary Source	APCD Specialist	6	495
Policy and Regulation	Specialist	6	2,642
Economic/Finance	Economist – AQM	6	751
Health	Health Specialist – AQM	6	322
Inventory, Modelling, and Forecasting	Data Portal Developer/Coordinators	6	414
Inventory, Modelling, and Forecasting	Specialist	6	1,249
Air Quality Planning	Specialist	6	1,526
Air Pollution Monitoring and Control – Mobile Source	Specialist	6	2,848
Air Pollution Monitoring and Control – Stationary Source	Specialist	6	9,431
Air Pollution Monitoring and Control – Area Source	Specialist	6	9,876
Air Quality Management – General	Data Scientist	6	3,933
Air Quality Planning	Air Quality Manager – Urban	6	2,492
Air Quality Management – General	Communicator	6	2,598
Audit, Inspection, and Enforcement	Air Quality Inspector/Auditor	6	8,194
Air Pollution Monitoring and Control – Stationary Source	Monitoring Manager	5	4,487

Sector/Sub-sector	Job Role	NSQF Level	No. of Jobs
Ambient Air Quality Monitoring	Scientist/Monitoring manager	5	6,558
Air Pollution Monitoring and Control – Mobile Source	Lab Scientist	5	100
Air Pollution Monitoring and Control – Stationary Source	Supervisor APCD	5	30,021
Air Quality Management – General	Researcher/Analyst	5	15,578
Air Quality Management – General	Data Analyst	5	13,895
Audit, Inspection, and Enforcement	Junior Inspector/Auditor	5	19,210
Air Pollution Monitoring and Control – Area Source	Ward Supervisor	5	34,035
Air Pollution Monitoring and Control – Area Source	Field Supervisor	5	3,274
Air Pollution Monitoring and Control – Stationary Source	APCD Technician	4	65,643
Air Pollution Monitoring and Control – Stationary Source	Monitoring Technician	4	12,546
Ambient Air Quality Monitoring	Field Technician	4	13,186
Air Pollution Monitoring and Control – Stationary Source	Junior Lab Scientist	4	11,666
Air Pollution Monitoring and Control – Mobile Source	Junior Lab Scientist	4	250
Air Pollution Monitoring and Control – Stationary Source	Maintenance Assistant – APCD	3	1,54,785
Air Pollution Monitoring and Control – Mobile Source	Operator – PUC Centre	3	51,777
Air Pollution Monitoring and Control – Area Source	Municipal Worker	2	15,00,000
Total			**20,22,939**

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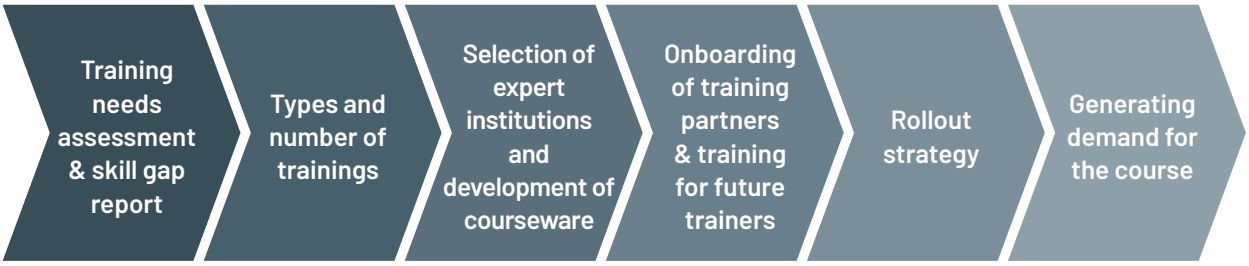
Capacity-Development Strategy

The proposed capacity-development strategy for air quality management (AQM) follows a six-stage development process, as depicted in Figure 23.

Figure 23: Stages of the capacity-development strategy



5.1 Training needs and skill gap assessment

This report shares the results from the training needs assessment (TNA) discussed in Section 3. The report also serves as a skill gap report for the AQM sector as it clearly details the job roles, their National Skills Qualifications Framework (NSQF) level, required technical and professional knowledge, and the estimated number of jobs in the industry (see Section 4).

5.2 Training courses

There are at least 42 different job roles and 2.02 million present and future jobs in the AQM sector. The NSQF levels of these jobs range from level two to level eight. Considering the diversity in job roles and the number of prospective trainees, the National Programme for AQM will require different types of training for different target groups. For effective implementation of the capacity-development programme, the following six types of training programmes will be necessary:

1. Bridge courses: These are general courses with a duration of one to three days designed to bridge the knowledge gap of the stakeholders working in the AQM sector. For example, an induction course on air quality for top management is a bridge course. Most induction courses being offered presently will fall under the bridge course category (see Section 3.1).

2. Advanced courses on a particular subject: These courses have a duration of three to five days and deal with a specific topic. The objective of these courses is to make the participants experts in a specific subject matter. They are also a type of bridge course, but for a specialized topic. These training programmes are majorly for sector experts. Some trainings being offered currently, like modelling, will fall under this category.

3. Short-term tailored training programmes: These training programmes are tailored as per the requirement of an industry. The duration of these courses is one to four weeks and they target senior to mid-level professionals and managers. Presently, very few courses are being offered in this category in India for AQM.

4. Short-term NSQF aligned training programmes: These courses will follow the full pattern of NSQF but will last for a shorter duration of one to two months. They could be conducted as part of a Master of Vocation (M.Voc.) or a Bachelor of Vocation (B.Voc.) degree. These courses are well suited for college graduates and entry-level positions at NSQF level five or six. None of the training courses being offered currently in the AQM sector fall in this category.

5. NSQF aligned courses: These are full-fledged skill development courses ranging from one and a half to six months, depending on the type of job role. These courses are designed for job roles of NSQF level four or below. These training programmes can be rolled out with affiliated training providers. None of the courses currently offered are in this category.

6. Recognition of prior learning: Recognition of Prior Learning (RPL) is a skill certification process to enable people with prior learning experience or skills to get assessed and certified. A short-term refresher course is generally organized for the trainees before assessment. It is largely targeted at individuals engaged in jobs at NSQF levels two and three.

Table 11 below, details the type, NSQF level, duration, and mode of instruction for different types of training.

Table 11: Types of training courses

S. No.	Course Type	NSQF Level	Duration	Online	Physical
1	Bridge Course	8	1-3 days	✔	✔
2	Advanced Course on the Subject	8, 7	3-5 days	✔	✔
3	Short-term Tailored Training Program	7, 6	1-4 weeks	✔	✔
4	Short-term NSQF Aligned Training Program	6, 5	1-2 months	✔	✔
5	NSQF Aligned Courses	4, 3	1.5-6 months		✔
6	Recognition of Prior Learning	4, 3, 2	1-3 days		✔

5.3 Number of trainings

The number of trainings required for a job role varies depending on the level of expertise required to perform it. In general, at lower NSQF levels (five and below), one training for each job role is sufficient. However, at higher NSQF levels (six and above), where short-term tailored training programmes dominate, multiple trainings might be required. For the National Programme, it is recommended that at least one training programme be developed for each job role. The different types of training required for the 42 job roles are given below in Table 12.

Table 12: Course types and number of courses

S. No.	Course Type	NSQF Level	Number of Courses
1	Bridge Course	8	1
2	Advanced Course on the Subject	8, 7	7
3	Short-term Tailored Training Programme	7, 6	16
4	Short-term NSQF Aligned Training Programme	6, 5	11
5	NSQF Aligned Courses	4, 3	6
6	Recognition of Prior Learning	4, 3, 2	4

Note: Some of the courses will be carried out through both RPL and NSQF aligned courses. NSQF aligned courses will be for the new entrants, whereas RPL will be for people currently working in the sector.

From the above, it is clear that the majority of the required courses are either short-term tailored training programmes (one to four weeks) or short-term NSQF aligned training programmes (one to two months). While together these account for about two-thirds of the training programmes, most of the trainings currently available are bridge courses or advanced courses (see Section 3).

5.4 Expert institutions for training development

A detailed mapping of 22 institutions/organizations (18 national and four international), currently providing training programmes on AQM, was undertaken to assess their competencies in developing these programmes. Table 13 lists the competencies of these institutions in various sub-sectors. The summary is given in Table 14.

Table 13: Competencies of institutions in AQM sub-sectors

S. No.	Organization Name	AQM – General	AAQ Monitoring	Air Quality Planning	Policy & Regulation	Health	Audit, Inspection, and Enforcement	Economics	Inventory, Forecasting, and Modelling	Mobile Source	Area Source	Stationary Source
1	School of Environmental Sciences, Jawaharlal Nehru University	✔										
2	IIT Madras	✔	✔		✔							
3	JNTUH College of Engineering, Hyderabad	✔	✔						✔			✔
4	Dr B R Ambedkar National Institute of Technology, Jalandhar											✔
5	NEERI	✔	✔	✔			✔					✔
6	IIT Delhi	✔	✔						✔			
7	CSE			✔	✔		✔			✔		
8	TERI University	✔		✔	✔				✔			
9	IIT Kanpur	✔	✔						✔			✔
10	Ekonnect Knowledge Foundation	✔							✔			
11	Environment Protection Training and Research Institute	✔										✔
12	IITM		✔						✔			
13	CSIR-Indian Institute of Toxicology Research, Lucknow		✔			✔						
14	Post Graduate Institute of Medical Education & Research, Chandigarh					✔						
15	Central Pollution Control Board	✔	✔				✔					✔
16	AIIMS					✔						
17	ARAI									✔		
18	iFOREST	✔		✔	✔		✔					
19	US EPA- Air Pollution Training Institute	✔	✔			✔	✔		✔	✔		✔
20	The World Bank Group	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔
21	Clean Air Asia	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔
22	ADB – Knowledgeable Events and Clarity Movement Co.	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

Note: Competency was judged on the basis of the number and types of training programmes delivered in the past by the institution in different sub-sectors. If an institution had designed and delivered at least one training programme in a sub-sector, it was considered as having the competency to deliver training in that sub-sector.

Table 14: Competencies of national and international organizations in various sub-sectors

Institutions	AQM – General	AAQ Monitoring	Air Quality Planning	Policy & Regulation	Health	Audit, Inspection, and Enforcement	Economics	Inventory, Forecasting, and Modelling	Mobile Source	Area Source	Stationary Source
National	11	8	4	4	3	4	0	6	2	0	6
International	4	4	3	3	4	3	2	4	4	3	4
Total	**15**	**12**	**7**	**7**	**7**	**7**	**2**	**10**	**6**	**3**	**10**

The assessment shows that the national institutions have limited competency for many sub-sectors. For example:

- There are no national institutions/organizations that have developed training courses on managing air pollution from area sources or on the economic aspects of AQM.
- A limited number of institutions have competencies in sectors such as mobile sources, health, air quality planning, and policy and regulations.
- A fairly large number of organizations have developed training courses on AQM – General, AAQ monitoring, inventory, forecasting, and modelling, and management of stationary sources.
- Overall, there are many gaps in national institutions in areas such as planning, policy and regulation, economics, health, area sources, and mobile sources.

These gaps can be filled by international organizations such as the World Bank Group, ADB, Clean Air Asia, and US EPA. These organizations have developed training courses in almost all sub-sectors. However, these courses will have to be tailored for Indian conditions and meet the requirements of the NSQF.

Over time, as more institutions gain competencies to develop and deliver courses, they can be included in the list by the nodal agency spearheading the National Programme.

5.5 Development of standards and courseware

The process of developing the training programmes will be different for different types of training. For RPL and NSQF aligned courses, the Skill Council for Green Jobs (SCGJ) or other relevant sector skill councils will have to develop standards and roll out the job roles in the form of National Occupational Standards (NOS) and Qualification Packs (QP). However, the courseware for these will be developed with the help of expert institutions listed in Section 5.4. Overall, of the 42 job roles, at least 14 job roles will require NOS/QP, which can be developed by SCGJ or other related skill councils such as IT-ITeS Sector Skill Council, Automobile Sector Skill Council, Power Sector Skill Council and Indian Iron and Steel Sector Skill Council. Table 15 below lists the number of courses for which NOS and QP will have to be developed.

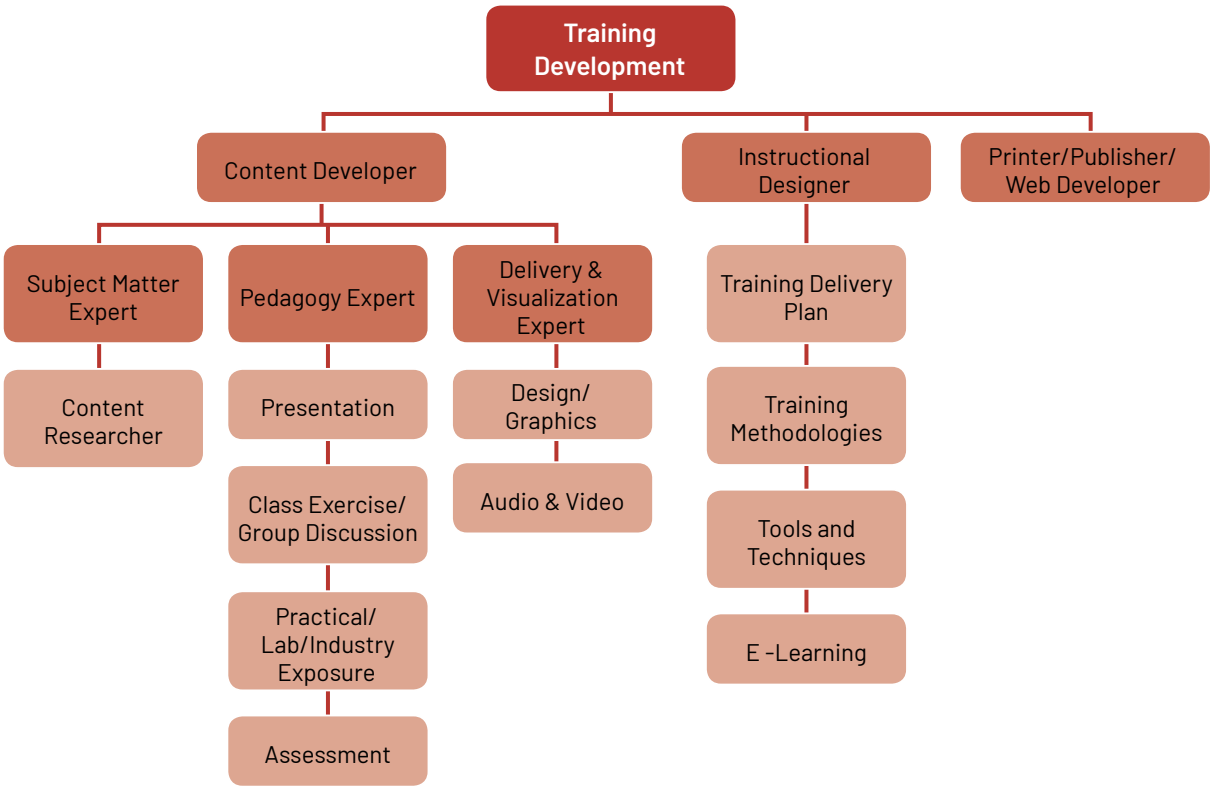
Unlike RPL and NSQF aligned courses, bridge courses, advanced courses, and short-term tailored courses can be developed and delivered directly by any institution with competency. The assessment and certification of these courses, however, can be done in partnership with skill councils. The expert institutions discussed in the last section can serve as the key organizations for developing the courseware for these job roles.

Table 15: National occupational standards and qualification packs for NSQF aligned courses

S. No.	Type of Course	No. of Courses	Potential NOS/QP Development Agency
1	RPL/NSQF Aligned Courses	4	• Skill Council for Green Jobs • Automobile Sector Skill Council for PUC Operator • Power Sector Skill Council/Indian Iron and Steel Sector Skill Council for Stationary Source
2	NSQF Aligned Courses	4	• Skill Council for Green Jobs • Automobile Sector Skill Council for PUC Operator • Power Sector Skill Council/Indian Iron and Steel Sector Skill Council for Stationary Source
3	Short-term NSQF Aligned Training Programme	10	• Skill Council for Green Jobs • IT-ITeS Sector Skill Council for Data Analyst

The development of content should be done using instructional design models recommended by the National Skill Development Corporation, like ADDIE or ARCS. ADDIE – Analyze, Design, Develop, Implement, and Evaluate – is a content-centric model and ARCS – Attention, Relevance, Confidence, and Satisfaction – is a learner-centric model.[5] ADDIE and ARCS are Instructional Design Models recommended by the National Skill Development Corporation. As of today, none of the organizations have developed courseware based on ADDIE/ARCS. So, the course materials will have to be refashioned, for which separate task teams will be required as shown in Figure 24 below.

Figure 24: Task teams for the development of courseware



5.6 Training delivery partners

To roll out each of the courses, training providers/partners need to be identified. The training providers will have qualified trainers, facilities, and adequate experience to carry out specific training programmes. Each training partner will have to be supported with funding. Some courses may be funded by participants themselves (NSQF level six or above), but for NSQF level two to five, funding will have to come from government agencies, bilateral/multilateral agencies, industries, or other sources, as discussed in Section 5.7. The possible training partners for the proposed National Programme are listed in Table 16.

Table16: Training delivery partners

S. No.	Course Type	Training Delivery Partners
1	Bridge Course	NKN, International agencies such as the World Bank Group
2	Advanced Course on the Subject	NKN, International agencies such as the World Bank Group, IoRs, Select NGOs/Think Tanks, and Academic and Research Institutes
3	Short-term Tailored Training Programme	NKN, IoRs, Select NGOs/Think Tanks, and Academic and Research Institutes
4	Short-term NSQF Aligned Training Programme	IORs, Affiliated Academic Institutes, and ITI/Diploma Colleges
5	NSQF Aligned Courses	Affiliated Training Partners of Sector Skill Councils, and ITI/Diploma Colleges
6	RPL	Affiliated Training Partners of Sector Skill Councils

For each course, training delivery partners should be properly vetted for qualified trainers, facilities, and adequate experience to carry out specific training programmes.

5.7 Training rollout strategy

The rollout strategy for delivering the trainings will largely depend on the number of trainees and funding sources. It is recommended that the training be rolled out in phases. All the high-priority trainings should be conducted under Phase 1 in the first five years.

(a). Number of trainees

To estimate the number of trainees in the high priority category, a multi-factorial analysis was undertaken, which prioritized the training requirements for various job roles. The factors considered for the analysis are:

1. Training required to achieve quick improvements in air quality (low-hanging target group)
2. Acute shortage of trained manpower
3. Potential for job creation and upskilling
4. Demand in the industry
5. Training demand

Based on the above analysis, the training requirements are prioritized under four categories – Very High, High, Moderate, and Low. For estimating the number of trainees over the next five years, a certain percentage of total jobs was considered. For example, 50 per cent of the total jobs in the 'Very High' category were deemed as prospective trainees, whereas the number of trainees in the 'High' category was deemed to be 25 per cent of the total jobs. These numbers can be modified based on the availability of resources.

Table 17: Estimated number of trainees at different priority levels

Training Requirement Category	Number of Trainees (As a Percentage of Total Jobs)
Very High	50%
High	25%
Moderate	10%
Low	5%

The priority level and the number of trainees for various job roles are given in Table 18. The job role-wise details are in Annexure 4.

As can be seen in Table 18, there are 16 job roles at the 'Very High' priority level with a total of 0.934 million trainees. A large majority of these trainees are municipal workers, PUC operators, and maintenance assistants for pollution control devices. The number of job roles at the 'High' priority level is seven with 5850 trainees. These are specialized job roles at NSQF levels five to seven. At the 'Moderate' and 'Low' level, there are nine and ten job roles, respectively.

Table 18: Number of job roles and trainees at different priority levels

Priority Level	Number of job roles	Number of Trainees
Very High	16	9,34,000
High	7	5,850
Moderate	9	4,200
Low	10	2,175
Total	**42**	**9,46,225**

The largest number of trainees – 93 per cent – will be trained under the RPL and NSQF aligned courses. These will fall under eight job roles at NSQF levels two, three, and four. The second-largest number of trainees – about 42250 – will be trained under short-term NSQF aligned training. These are largely at NSQF level five. The remaining three categories – short-term tailored training, advanced course, and bridge course – will cater to NSQF levels six to eight and will have about 15500 trainees (see Table 19).

Table 19: Number of trainees under different courses

Course Type	Number of Job Roles	Number of Trainees	NSQF Levels
RPL/NSQF Aligned Course	4	8,75,000	2, 3
NSQF Aligned Course	4	13,500	4
Short-term NSQF Aligned Training	10	42,250	5, 6
Short-term Tailored Training	16	8,025	6
Advanced Course	7	2,450	7
Bridge Course	1	5,000	1
Total	**42**	**9,46,225**	

(b). Funding sources

For funding the training programmes, resources will have to be mobilized from a wide range of institutions/ organizations and by getting some of the courses funded through individual and company-sponsored training. The possible sources of funds and the target groups are given in Table 20.

Table 20: Funding sources for training

S. No.	Source of Funding	Target Group	Remarks
1	National Skill Development Corporation (NSDC)/National Skill Development Fund	NSQF Level 2, 3, and 4	Potential funder for RPL and NSQF aligned courses
2	Ministry of Housing and Urban Affairs	NSQF Level 2 and 3	Training of municipal workers under Swachh Bharat Mission
3	Ministry of Road Transport and Highways	NSQF Level 3 and 4	Training of PUC operators
4	National Clean Air Programme/ National Mission for Clean Air	NSQF Level 5, 6, 7, and 8	NCAP/NMCA can potentially fund training for NSQF Level 5 and above
5	National Safai Karamcharis Finance and Development Corporation	NSQF Level 2 and 3	Training of municipal workers
6	Multilateral/Bilateral Agencies	All	They can provide funding for training development and for targeted training
7	Foundations	All	They can provide funding for training development and for targeted training
8	Company Sponsored	NSQF Level 4, 5, and 6	Companies can fund training of their employees to upskill them
9	Individual Funded	NSQF Level 5 and above	For trainings that will lead to new jobs

As can be seen, the Government of India itself can be the most important funder. NSDC and NCAP can potentially provide large resources for training delivery. On the other hand, multilateral agencies, such as the World Bank Group, can also support training development and targeted training. There is also the potential for individual and company-sponsored training.

(c). Year-wise training target

The trainings should be done in phases. In Phase 1, the National Programme should target conducting trainings for 0.95 million prospective trainees over the next five years (2022-2027). Based on the progress made in Phase 1, a second phase can be rolled out for the remaining 1.07 million trainees. Phase 2 should be designed based on the mid-term evaluation of Phase 1 after three years.

The year-wise targets for training can be developed using the following criteria:

1. Level and complexity of training: Complex and highly specialized training should be rolled out slowly compared to simple and repetitive training.

2. Availability of sector experts and training partners: Training with an adequate number of sector experts and training partners can be conducted quickly compared to those with limited experts and training partners.

3. Pace of demand in the sector: Training for job roles for which the industry demand is high should be conducted early compared to those with moderate and low demand.

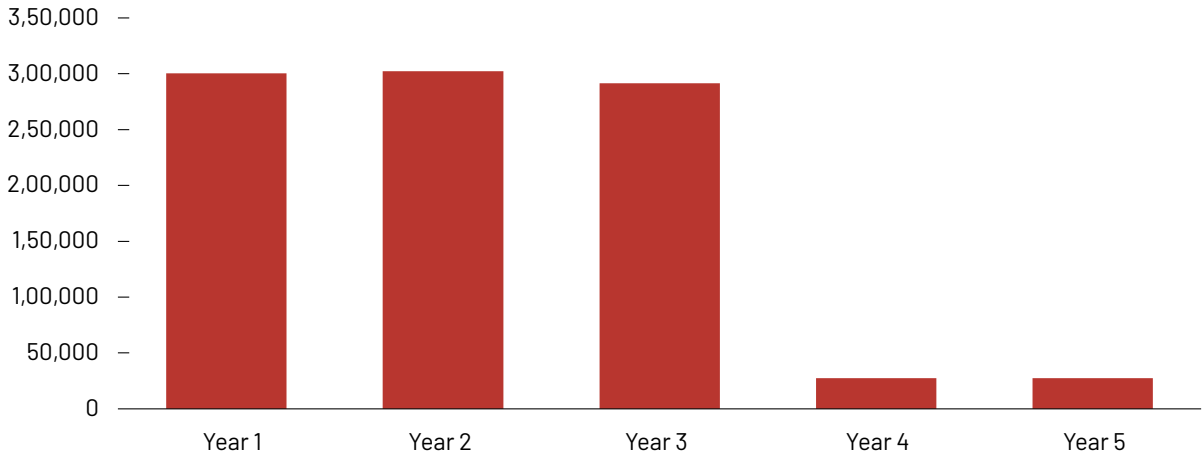
4. Number of prospective trainees: Training of a larger number of trainees should be spread out over five years; a smaller number of trainees can be trained in a few years.

Based on the above criteria, the five-year rollout strategy for Phase 1 is given in Table 21 and Figure 25. The job role-wise details are in Annexure 5.

Table 21: Year-wise number of trainees at different NSQF levels

NSQF Level	Number of Trainees					
	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Level 2	2,50,000	2,50,000	2,50,000	0	0	7,50,000
Level 3	25,000	25,000	20,000	15,000	15,000	1,00,000
Level 4	11,450	11,450	5,200	5,200	5,200	38,500
Level 5	9,800	10,050	10,100	5,900	5,900	40,750
Level 6	2,500	3,200	3,625	925	925	10,275
Level 7	350	350	250	250	250	1,450
Level 8	1,200	2,200	2,200	200	200	6,000
Total Across all NSQF Levels	**3,00,300**	**3,02,250**	**2,91,375**	**27,475**	**27,475**	**9,46,225**

Figure 25: Year-wise number of trainees



As depicted in Figure 25, most of the trainees will be trained in the first three years (approximately 94 per cent). The remaining six per cent, numbering approximately 55000, will be trained in the fourth and the fifth year.

(d). Training costs

An extensive survey of government-funded training programmes and those conducted by academic/research institutions and the private sector was carried out to estimate the costs of various types of training.

(i). Government-funded trainings

Every year the Ministry of Skill Development and Entrepreneurship (MSDE), announces common cost norms for the skill development schemes of the Government of India. These costs are generally applicable to RPL and NSQF aligned courses for levels two to four.

The common costs announced on 1 January 2021 are as follows:

- Training costs = ₹35.10 – ₹49.00 per hour
- Boarding & lodging costs = ₹220 – ₹375 per day

By extrapolating the common costs, we can estimate the total cost of training per participant. The following are the per-participant costs of government-funded training:

1. Recognition of prior learning = About ₹5,000 per participant
2. NSQF aligned courses = ₹35,000 – ₹50,000 per participant

(ii). Trainings organized by academic/research institutions and the private sector

There is a wide diversity in training costs. A five-day training cost varies from ₹7,500 to ₹35,000 per participant. While there are very few month-long trainings, discussions with training providers indicate that the training cost for a four to six-week training can vary from ₹50,000 to ₹1,00,000 per participant, excluding the boarding and lodging costs.

Based on the market survey and discussions with training experts and agencies, the average training costs for different types of training are given in Table 22 below.

Table 22: Training costs per participant

Training Type	Duration	Cost Per Participant	Remarks
RPL	2 days	5,000	Including Boarding and Lodging Cost
NSQF Aligned Course (Without Lab Training)	45 days	35,000	Including Boarding and Lodging Cost
NSQF Aligned Course (With Lab Training)	45 days	50,000	Including Boarding and Lodging Cost
Short-term NSQF Aligned Training Programme	30 days	50,000	Excluding Boarding and Lodging Cost
Short-term Tailored Training Programme	10 days	25,000	Excluding Boarding and Lodging Cost
Bridge Course	5 days	20,000	Excluding Boarding and Lodging Cost
Bridge Course (Level 8)	2 days	15,000	Excluding Boarding and Lodging Cost

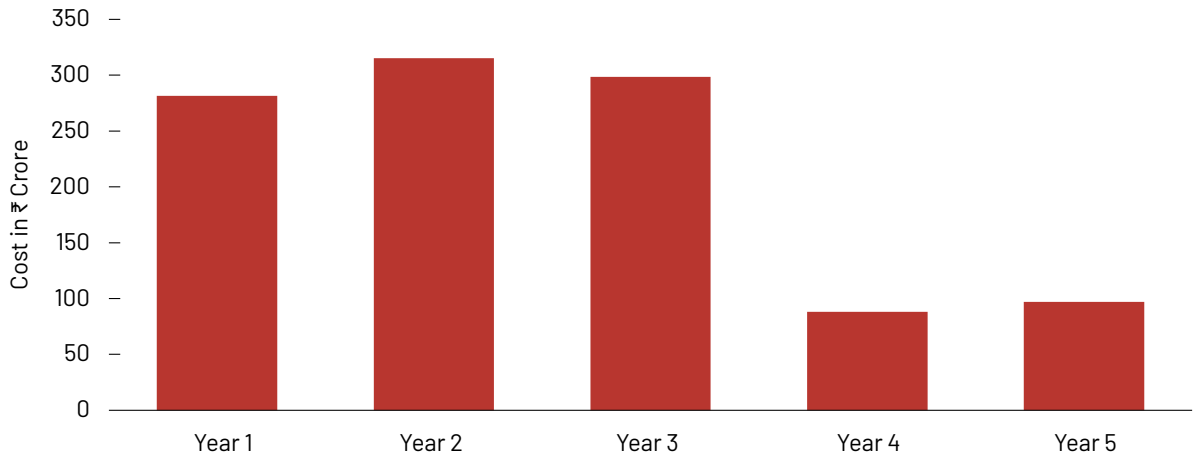
Based on the number of trainees (Table 21) and training costs, the estimated year-wise cost of training 0.95 million trainees in 42 job roles, for the first phase, has been given in Table 23 and Figure 26. The job role-wise yearly training costs, funding partner, and certification agency is given in Annexure 6.

Table 23: Year-wise cost of training courses (in ₹ crores)

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
RPL/NSQF Aligned Course	162.5	178.8	189.1	33.3	36.6	**600.2**
NSQF Aligned Course	32.3	35.5	1.2	1.3	1.5	**71.7**
Short-term NSQF Aligned Training Programme	50.3	58	65.6	39.3	43.2	**256.4**
Short-term Tailored Training Programme	5.6	6.7	7.2	3.1	3.4	**26**
Advanced Course	1.1	1.2	1.1	1.2	1.3	**5.9**
Bridge Course	1.5	3.3	3.6	0	0	**8.4**
Total Training Delivery Cost	253.2	283.5	267.8	78.1	86	**968.6**
Course Development Cost[1] (10% of Training Course for NSQF Level 5 and Above)	15.6	17.6	17.3	6.1	6.7	**63.3**
Trainee Mobilization Cost[2]	12.7	14.2	13.4	3.9	4.3	**48.4**
Total Training Cost[3]	**281.5**	**315.3**	**298.5**	**88.1**	**97**	**1,080.3**

Note: 1. Course development cost is estimated to be 10 per cent for training courses of NSQF level five and above. For NSQF levels two, three, and four, it is estimated to be 5 per cent.
2. Training mobilization cost is estimated to be 5 per cent of the training cost.
3. An increase of 10 per cent every year has been built in the training costs. This is to account for inflation and other increase in costs.

Figure 26: Year-wise training cost (in ₹ crore)



Phase 1 of the training programme will cost about ₹1,080 crore (approximately US$ 140M) over a period of five years. The majority of costs, however, will be incurred in the first three years when the largest number of trainees will be trained.

5.8 Generating demand for courses

The training for these job roles is important for the AQM sector, but these courses will not attract participation if they are not incentivized or the prospective candidates are not motivated. The motivation for getting enrolled in a training programme is different for different types of candidates. For some candidates, the motivation is the upgradation of skills or employment potential and for others, it is lateral movement in an organization. However, considering that AQM is a completely new sector, the following strategies can be deployed to create demand for training:

1. Mandated training by the employer: Organizations and industries in the AQM sector will have to mandate training for their existing staff. For example, municipal workers and ward supervisors will have to be mandated by the ULBs to undergo training.

2. Mandated job role by the government: New job roles can be created by government mandate. For example, air quality manager for cities should be mandated under the NCAP. People getting into these new job roles should be mandatorily asked to undergo training.

3. Awareness campaign: These trainings should be advertised to mobilize prospective trainees. Social media should be widely used to create awareness about the training.

4. Training as a business proposition: The training partners will have to see these trainings as a viable business proposition and market these trainings.

Figure 27: Framework for generating training demand

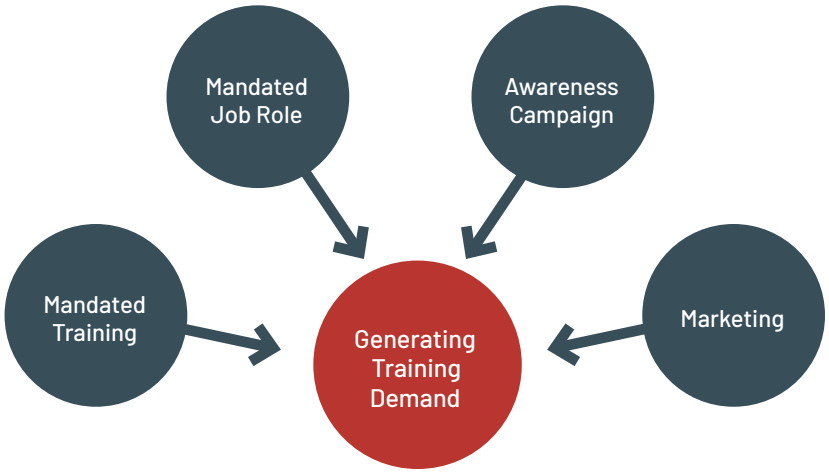


Table 24 below, provides a snapshot of the strategy for different types of courses.

Table 24: Strategy for creating training demand

S. No.	Course Type	Strategy for Creating Training Demand
1	Bridge Course	Mandated Training by Employer Awareness Campaign Marketing of Training
2	Advanced Course on the Subject	Awareness Campaign Marketing of Training
3	Short-term Tailored Training Programme	Mandated Training by Employer Mandated Job Role by Government Awareness Campaign Marketing of Training
4	Short-term NSQF Aligned Training Programme	Mandated Training by Employer Mandated Job Role by Government
5	NSQF Aligned Courses	Mandated Training by Employer Mandated Job Role by Government

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Recommendations

In a country like India, where traditional and modern co-exists, air quality management (AQM) is a complex task. India has the largest number of people using biomass as cooking fuel[6] while also being the world's second-largest LPG consumer, largely due to a massive increase in the use of LPG as a cooking fuel[7]. Similarly, while it is the second-largest consumer of coal[8], it also has the fourth-largest installation of renewable energy in the world[9]. While India is home to some of the most congested cities in the world[10], it also has the largest number of people who walk or cycle to work[11]. Within these contrasts, India has to find answers to deal with its air pollution levels, which are amongst the highest in the world; answers that can only be provided by a trained workforce.

Currently, the capacity development in the AQM sector is ad hoc. Training is largely imparted by international organizations and is not specific to jobs. The capacity of the national institutions and organizations to deliver training is limited. Therefore, it is unsurprising that the training demand by all stakeholders is very high, as was found during the training needs assessment under this project.

The Ministry of Environment, Forest and Climate Change (MoEF&CC), which is implementing the National Clean Air Programme (NCAP), and is soon launching a National Mission for Clean Air (NMCA), is actively promoting the development of capacity to meet NCAP/NMCA goals. In this regard, one of the key objectives of the NMCA is capacity building for various stakeholders including state pollution control boards/pollution control committees and urban local bodies.

To support the capacity development efforts of MoEF&CC, the National Knowledge Network (NKN) and the World Bank Group have come together to design recommendations for a National Programme for Capacity Development for Air Quality Management. The International Forum for Environment, Sustainability and Technology (iFOREST), which is part of the NKN, was assigned the responsibility to take the lead in developing the contours of the proposed National Programme.

Based on the detailed analysis presented in this report, the recommendations for the National Programme for Capacity Development for Air Quality Management are as follows:

1	**Scope:**	Training for 42 job roles in AQM; at least one training for each job role
2	**Training levels:**	National Skills Qualifications Framework (NSQF) level two to level eight
3	**Number of trainees:**	0.95 million
4	**Duration:**	Five years
5	**Budget:**	₹1,080 crore (US$ 140 million)
6	**Lead ministry:**	Ministry of Environment, Forest & Climate Change
7	**Expert institutions for training development:**	18 national and four international Institutes
8	**Training partners:**	National Knowledge Network, multilateral institutions, institutes of repute, key NGOs and think tanks, selected academic and research institutions, and training partners of sector skill councils.
9	**Lead Sector Skill Council:**	Skill Council for Green Jobs
10	**Major funding sources:**	National Skill Development Fund, National Clean Air Programme/ National Mission for Clean Air, and multilateral/bilateral agencies and foundations

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Annexures

Annexure 1: List of Existing Training Programmes

S. No.	Course Name	Course Link	Duration in Days	Organization Name	Organization Type	Assessment System	Delivery Mechanism
1	A Hybrid Approach to Develop Time-Space Resolved Estimates of Air Quality (F1)	https://jnu.ac.in/sites/default/files/AHybrisApproach_ArunSrivastava.pdf	5	School of Environmental Sciences (Jawaharlal Nehru University), New Delhi under Global Initiative of Academic Networks (GIAN)	Research and Academia	Examination	F2F
2	Urban Air Pollution, Human Exposure Assessment, and Public Policy (F2)	https://cce.iitm.ac.in/files/Urban%20Air%20Pollution.pdf	10	IIT Madras under GIAN	Research and Academia	Examination	F2F
3	Air Pollution Control Technologies	https://gian.iitkgp.ac.in/files/brochures/BR1525504554Jayantyfinal_Broucher_Air_pollution_control__1_.pdf	5	JNTUH College of Engineering, Kukatpally, Hyderabad	Research and Academia	Module-wise Evaluation and Grading.	F2F
4	Advanced Numerical Modelling of Meteorology and Emissions for AQM	https://gian.iitkgp.ac.in/files/brochures/BR1525504615Arunachalamfinal_Brochure_Advanced_Numerical_Modeling_of_Meteorology_and_Emissions_for_Air_Quality_Modeling_SA__2___1_.pdf	5	JNTUH College of Engineering, Kukatpally, Hyderabad	Research and Academia	NA	F2F
5	AQM: Quality Assurance and Data Analysis	https://gian.iitkgp.ac.in/files/brochures/BR1453720843(739720396)_gian_bROCHURE_155052C01.pdf	5	JNTUH College of Engineering, Kukatpally, Hyderabad	Research and Academia	Module-wise Evaluation and Grading.	F2F
6	Air Pollution Control Techniques: Design and Development (F6)	https://gian.iitkgp.ac.in/files/brochures/BR1496400562Air_Pollution_Control_Techniques_2_June_2017_pdf.pdf	5	Dr B R Ambedkar National Institute of Technology, Jalandhar under GIAN	Research and Academia	Assignments	F2F

S. No.	Course Name	Course Link	Duration in Days	Organization Name	Organization Type	Assessment System	Delivery Mechanism
7	Monitoring and Analysis of Toxics in Air and Water Media for Vizag Steel Plant	https://www.neeri.res.in/divisions/training_program/rd-division-air-pollution-control-division	5	National Environmental Engineering Research Institute	Research and Academia	NA	NA
8	Certificate Course on Pollution Monitoring (Air and Water/Soil Pollution)	http://gsdpenvis.gov.in/Upload/List_for_duration.pdf	33	Green Skill Development Program – MoEF&CC, GoI	Regulatory/ Government Agency	NA	NA
9	Environmental Air Pollution	https://nptel.ac.in/courses/105/102/105102089/	Self-paced	IIT Delhi	Research and Academia	Online Quizzes/ Exams and Certification	E-learning
10	Training Program on Urban Air Quality: Understanding and Preparing Industry-Specific Action Plans	https://www.cseindia.org/urban-air-quality-understanding-and-preparing-industry-specific-action-plans-9853	4	Centre for Science and Environment (CSE) New Delhi	Civil Society Organization	NA	F2F
11	AQM	http://elearning.teriuniversity.ac.in/showcat.php?id=3	Self-paced	TERI University	Research and Academia	Assignments and Quizzes	E-learning
12	Environmental Air Pollution	https://nptel.ac.in/courses/105/104/105104099/	Self-paced	IIT Kanpur	Research and Academia	Online Quizzes/ Exams and Certification	E-learning
13	Clean Air and Sustainable Environment (CASE) Project Training Program	https://ekonnect.net/services/training	5	Ekonnect Knowledge Foundation	Consultant	Assignments	F2F
14	Air Quality Data Analytics	https://ekonnect.net/services/training	2	Ekonnect Knowledge Foundation	Consultant	Assignments	F2F
15	Air Pollution Monitoring, Mitigation, and Control	http://www.eptri.com/wp-content/uploads/2018/04/Training-Calendar-2018-2019.pdf	3	Environment Protection Training and Research Institute	Research and Academia	NA	F2F

S. No.	Course Name	Course Link	Duration in Days	Organization Name	Organization Type	Assessment System	Delivery Mechanism
16	Emission Inventory, and Pollution Monitoring	https://www.tropmet.res.in/180-event_details	45	Indian Institute of Tropical Meteorology (IITM), under GSDP	Research and Academia	NA	F2F
17	How to develop an AQM Plan for Industrial Areas	https://elearn.cseindia.org/course/view.php?id=18	14	CSE	Civil Society Organization	Quiz and Assignment	E-learning
18	Air Pollution Data Analysis Using OpenAir on R	https://m.dexlabanalytics.com/courses/r-programming	8	DexLab Analytics Gurgaon	Consulting	Hands-on Proficiency	E-learning
19	Introductory Course on the International Legal Framework on Transboundary Air Pollution	https://elearning.informea.org/pluginfile.php/1504/course/summary/Syllabus%20-%20Air%20Pollution.pdf	Self-paced	UN Environment Programme (UNEP) through The United Nations Information Portal on Multilateral Environmental Agreements (UN InforMEA)	Development Agency		E-learning
20	Air Quality, Climate Change, and Energy	https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/nedc/training/air/?cid=nrcs143_024091	Self-paced	Natural Resources Conservation Service (NRCS) under the National Employment Development Centre (NEDC)	Regulatory/ Government Agency	NA	E-learning
21	Why Should We Care About Air Quality?	https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/nedc/training/air/?cid=nrcs143_024092	Self-paced	United States Department of Agriculture – Natural Resources Conservation Service	Regulatory/ Government Agency	NA	E-learning
22	Air Quality Resource Concerns	https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/nedc/training/air/?cid=nrcs143_024093	Self-paced	United States Department of Agriculture – Natural Resources Conservation Service	Regulatory/ Government Agency	NA	E-learning
23	Introduction to Tribal Air Quality (Level 1)	https://www7.nau.edu/itep/main/Training/training_aq_itaq	4	Northern Arizona University – Institute for Tribal Environmental Professionals	Research and Academia	Writing Assignments Each Evening During the Course	F2F
24	Air Pollution Technology (Level 2)	https://www7.nau.edu/itep/main/Training/training_aq_apt	NA	Northern Arizona University – Institute for Tribal Environmental Professionals	Research and Academia	Homework-Based	F2F

S. No.	Course Name	Course Link	Duration in Days	Organization Name	Organization Type	Assessment System	Delivery Mechanism
25	Indoor Air Quality (IAQ) Diagnostic Tools (Level 2)	https://www7.nau.edu/itep/main/Training/training_aq_iaqdt	4	Northern Arizona University – Institute for Tribal Environmental Professionals	Research and Academia	NA	F2F
26	Air Quality Computations (COMP) (Level 1)	https://www7.nau.edu/itep/main/Training/training_aq_aqc	4	Northern Arizona University – Institute for Tribal Environmental Professionals	Research and Academia	NA	F2F
27	Fundamentals of Air Monitoring (Level 2) (F18)	https://www7.nau.edu/itep/main/Training/training_aq_fam	3	Northern Arizona University – Institute for Tribal Environmental Professionals	Research and Academia	Homework-Based	F2F
28	IAQ Instructor-led Online Course	https://www7.nau.edu/itep/main/Training/training_aq_iaqo	5	Northern Arizona University – Institute for Tribal Environmental Professionals	Research and Academia	Requires Completion of Group Discussions, Activities, and Assignments for Certificate of Completion.	E-learning
29	Introduction to Hazardous Air Pollutants	http://www.westar.org/Training/JTC/Curiculum%20Project/Course%20Catalog.pdf	2	United States Environmental Protection Agency (US EPA) – Air Pollution Training Institute	Regulatory/ Government Agency	NA	F2F
30	Control of Particulate Emissions	http://www.westar.org/Training/JTC/Curiculum%20Project/Course%20Catalog.pdf	4	US EPA – Air Pollution Training Institute	Regulatory/ Government Agency	NA	F2F
31	Atmospheric Sampling	http://www.westar.org/Training/JTC/Curiculum%20Project/Course%20Catalog.pdf	5	US EPA – Air Pollution Training Institute	Regulatory/ Government Agency	NA	F2F
32	Air Pollution Field Enforcement	http://www.westar.org/Training/JTC/Curiculum%20Project/Course%20Catalog.pdf	3.5	US EPA – Air Pollution Training Institute	Regulatory/ Government Agency	NA	F2F

S. No.	Course Name	Course Link	Duration in Days	Organization Name	Organization Type	Assessment System	Delivery Mechanism
33	Inspection of Particle Control Devices	http://www.westar.org/Training/JTC/Curiculum%20Project/Course%20Catalog.pdf	3	US EPA – Air Pollution Training Institute	Regulatory/ Government Agency	NA	F2F
34	Inspection Procedures and Safety	http://www.westar.org/Training/JTC/Curiculum%20Project/Course%20Catalog.pdf	2	US EPA – Air Pollution Training Institute	Regulatory/ Government Agency	NA	F2F
35	Source Sampling for Pollutants	http://www.westar.org/Training/JTC/Curiculum%20Project/Course%20Catalog.pdf	5	US EPA – Air Pollution Training Institute	Regulatory/ Government Agency	NA	F2F
36	Analytical Methods for Air Quality Standards	http://www.westar.org/Training/JTC/Curiculum%20Project/Course%20Catalog.pdf	5	US EPA – Air Pollution Training Institute	Regulatory/ Government Agency	NA	F2F
37	Computational Atmospheric Sciences: Meteorology for AQM	http://www.westar.org/Training/JTC/Curiculum%20Project/Course%20Catalog.pdf	Self-paced	US EPA – Air Pollution Training Institute	Regulatory/ Government Agency	NA	F2F
38	Introduction to Air Pollution Toxicology	http://www.westar.org/Training/JTC/Curiculum%20Project/Course%20Catalog.pdf	Self-paced	US EPA – Air Pollution Training Institute	Regulatory/ Government Agency	Quiz	E-Learning
39	Introduction to Boiler Operations	http://www.westar.org/Training/JTC/Curiculum%20Project/Course%20Catalog.pdf	Self-paced	US EPA – Air Pollution Training Institute	Regulatory/ Government Agency	Quiz	E-Learning
40	Network Design and Site Selection Monitoring for PM 2	http://www.westar.org/Training/JTC/Curiculum%20Project/Course%20Catalog.pdf	Self-paced	US EPA – Air Pollution Training Institute	Regulatory/ Government Agency	Quiz	E-learning
41	Site Selection Monitoring for Monitoring of SO2 and PM 10 in Ambient Air	http://www.westar.org/Training/JTC/Curiculum%20Project/Course%20Catalog.pdf	Self-paced	US EPA – Air Pollution Training Institute	Regulatory/ Government Agency	NA	E-learning
42	Accidental Release Modelling Workshop – International	https://www.trinityconsultants.com/training/air-quality-modeling	2	Trinity Consultants	Consulting	NA	E-learning

S. No.	Course Name	Course Link	Duration in Days	Organization Name	Organization Type	Assessment System	Delivery Mechanism
43	Air Pollution – A Global Threat to Our Health	https://www.coursera.org/learn/air-pollution-health-threat	Self-paced	The University of Copenhagen and Coursera	Research and Academia	Quiz	E-learning
44	Understanding and Managing Air Quality	https://www.casanz.org.au/course/understanding-and-managing-air-quality-30-31-july-6-7-august-2020/	2	Clean Air Society of Australia and New Zealand (CASANZ)	Civil Society Organization	NA	E-learning
45	Challenges in Air Emissions Management	https://www.epictraining.ca/course-catalogue/environmental/14313/air-emission-management	NA	Educational Program Innovations Center (EPIC)	Research and Academia	NA	E-learning/F2F
46	Interpreting Air Dispersion Model	https://www.epictraining.ca/course-catalogue/environmental/15915/interpreting-air-dispersion-model-results	NA	EPIC	Research and Academia	NA	E-learning/F2F
47	Air Pollution	https://ccsbestpractice.org.uk/courses/air-pollution/	Self-paced	The Best Practice Hub	Consulting	Quiz. Pass Rate for Course is 70% and Participants can Re-take the Quiz	E-learning
48	Air Pollution	https://www.ncl.ac.uk/sage.cpd/cpd/airpoll.php#aboutthecourse	5	Newcastle University – Faculty of Science, Agriculture, and Engineering	Research and Academia	NA	E-learning
49	Capacity Building Toward AQM	http://documents.doptcirculars.nic.in/D2/D02trn/12040-18-2017.pdf	25	Japan International Cooperation Agency (JICA)	Development Agency	NA	F2F
50	Introduction to IAQ	https://www.coursera.org/learn/intro-indoor-air-quality	Self-paced	Coursera and Hong Kong University of Science and Technology	Research and Academia	Quiz and Assignment	E-learning
51	Introduction to AQM	https://olc.worldbank.org/content/introduction-air-quality-management-self-paced	Self-paced	The World Bank	Development Agency	NA	E-learning

S. No.	Course Name	Course Link	Duration in Days	Organization Name	Organization Type	Assessment System	Delivery Mechanism
52	Air Pollution Control Management Training Course	https://www.tonex.com/training-courses/air-pollution-control-management-training-course/	2	Tonex – Technology and Management Training Courses and Seminars	Consulting	NA	E-learning/F2F
53	Air Quality and Health – Methods, Tools, and Practices for Better Air Quality Action Planning	https://ec.europa.eu/futurium/en/air-quality/training-course-air-quality-and-health-online	Self-paced	European Commission, Futurium Sub-committee (Urban Agenda for the EU)	Regulatory/ Government Agency	NA	E-learning
54	Air Emissions Training	https://ehs.yale.edu/trainings/air-emissions	Self-paced	Yale Environmental Health and Safety	Research and Academia	NA	E-learning
55	Contaminant and Vapor Migration and Intrusion	https://nwetc.org/course-catalog/vaqm-401-july-7-8-2020	1	Northwest Environmental Training Centre	Research and Academia	NA	E-learning
56	GIS for Air Quality Application	https://www7.nau.edu/itep/main/Training/training_wbl_sptgis	Self-paced	Northern Arizona University – Institute for Tribal Environmental Professionals	Research and Academia	NA	E-learning
57	Air Quality and Environmental Noise	https://www.cdc.gov/nceh/ehs/elearn/ephoc.htm	Self-paced	Center for Disease Control and Prevention in Collaboration with Tulane University School of Public Health and Tropical Medicine	Research and Academia	NA	E-learning
58	Acid Deposition and the Environment	https://www.cleanairinitiative.org/portal/node/1198/	NA	Clean Air Asia	Civil Society Organization	NA	E-learning
59	Advanced Training Course on Emission Inventory Database Development	https://www.cleanairinitiative.org/portal/knowledgebase/trainingcourses/Advanced_training_course_on_Emission_Inventory_Database_Development/	5	Clean Air Asia – Centre for Environmental and Natural Resources Monitoring and Analysis	Civil Society Organization	NA	F2F
60	Air Pollution and AQM	https://www.cleanairinitiative.org/portal/knowledgebase/trainingcourses/Air_Pollution_and_Air_Quality_Management__Regular_Course_/	120	Clean Air Asia – Asian Institute of Technology (AIT)	Research and Academia	NA	F2F

S. No.	Course Name	Course Link	Duration in Days	Organization Name	Organization Type	Assessment System	Delivery Mechanism
61	Air Pollution Modelling and Application	https://www.cleanairinitiative.org/portal/node/1095/	120	Clean Air Asia – AIT	Research and Academia	NA	F2F
62	Air Pollution Modelling Including Advanced Instruments Methods for Sampling and Development of Managerial Skills	https://www.cleanairinitiative.org/portal/node/1096/	60	Clean Air Asia – AIT	Research and Academia	NA	F2F
63	Air Toxics Program Training	https://www.cleanairinitiative.org/portal/node/1097/	4	Clean Air Asia – United States Environmental Protection Agency (USEPA)	Regulatory/ Government Agency	NA	F2F
64	Ambient Air Monitoring with Emphasis on Equipment Operation, Data Management, and Receptor Modelling	https://www.cleanairinitiative.org/portal/node/1098/	12	Clean Air Asia – AIT	Research and Academia	NA	F2F
65	Ambient Air Monitoring with Focus on QA/QC	https://www.cleanairinitiative.org/portal/node/1099/	6	Clean Air Asia – AIT and World Bank	Development Agency	NA	F2F
66	Basic Training Course for Plantation Workers/ Students	https://www.cleanairinitiative.org/portal/node/1100/	5	Clean Air Asia – Human Rights Society, Pakistan	Civil Society Organization	NA	F2F
67	Basic Urban AQM Course	https://www.cleanairinitiative.org/portal/node/1101/	4	Clean Air Asia – AIT and World Bank	Development Agency	NA	F2F
68	Capacity Building Program for Mainstreaming Environmentally Sustainable Transport (EST) in Local and Metropolitan Development in Metro Manila	https://www.cleanairinitiative.org/portal/node/1102/	40	Clean Air Asia	Development Agency	NA	F2F

S. No.	Course Name	Course Link	Duration in Days	Organization Name	Organization Type	Assessment System	Delivery Mechanism
69	Clean Air for Asia Training Course	https://www.cleanairinitiative.org/portal/node/1105/	10	Clean Air Asia – HCMC Environmental Protection Agency (HEPA), Stockholm Environment Institute (SEI)	Research and Academia	NA	F2F
70	Design of Air Pollution Control Systems	https://www.cleanairinitiative.org/portal/node/1106/	120	Clean Air Asia – AIT	Research and Academia	NA	F2F
71	Design, Installation, and Development of AQM Network, Operations, Maintenance, and QA/QC	https://www.cleanairinitiative.org/portal/node/1107/	5	Clean Air Asia – Alam Sekitar Malaysia Sdn. Bhd	Civil Society Organization	NA	F2F
72	Eco-driving Training	https://www.cleanairinitiative.org/portal/node/1109/	2	Clean Air Asia – Technical Training Agency, Indonesia (TTA – Indonesia)	Regulatory/ Government Agency	NA	F2F
73	AAQ Standards and Monitoring	https://lms.learning-cleanairasia.org/catalog/info/id:126	NA	Clean Air Asia – Integrated Programme for Better Air Quality in Asia	Civil Society Organization	NA	E-learning
74	Emission Inventory and Modelling	https://lms.learning-cleanairasia.org/catalog/info/id:127	NA	Clean Air Asia – Integrated Programme for Better Air Quality in Asia	Civil Society Organization	NA	E-learning
75	Health and Other Impacts	https://lms.learning-cleanairasia.org/catalog/info/id:128	NA	Clean Air Asia – Integrated Programme for Better Air Quality in Asia	Civil Society Organization	NA	E-learning
76	Air Quality Improvement in Beijing-Tianjin-Hebei Region	https://events.development.asia/materials/20190605/air-quality-improvement-bth-region	Self-paced	Development Asia – Asian Development Bank (ADB) Knowledgeable Events and Clarity Movement Co.	Development Agency	NA	E-learning
77	Training Courses on Climate Change and Information Services for Developing Countries	https://www.cleanairinitiative.org/portal/node/8785/	NA	Clean Air Asia	Civil Society Organization	NA	F2F

S. No.	Course Name	Course Link	Duration in Days	Organization Name	Organization Type	Assessment System	Delivery Mechanism
78	Training course on Fundamentals of Emission Inventory Development	https://www.cleanairinitiative.org/portal/node/1128/	4	Clean Air Asia – Centre for Environmental Monitoring and Modelling	Regulatory/ Government Agency	NA	F2F
79	Training course on AQM	https://www.cleanairinitiative.org/portal/node/1125/	3	Clean Air Asia – Swiss Vietnamese Clean Air Program	Development Agency	NA	F2F
80	Training course on AQM Station Operation and Maintenance	https://www.cleanairinitiative.org/portal/node/1124/	100	Clean Air Asia – HCMC Environmental Protection Agency (HEPA), Swiss Vietnamese Clean Air Program	Development Agency	NA	F2F
81	Sustainable Urbanization	https://www.cleanairinitiative.org/portal/node/1123/	5	Clean Air Asia – International Urban Training Centre	Research and Academia	NA	F2F
82	Sustainable Urban Transport, Bus Rapid Transit, Non-motorized Transport, Public Awareness, and Transport Demand Management	https://www.cleanairinitiative.org/portal/node/1121/	5	Clean Air Asia – Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH	Development Agency	NA	F2F
83	Receptor Modelling for Air Pollution Source Apportionment	https://www.cleanairinitiative.org/portal/knowledgebase/trainingcourses/Receptor_Modeling_for_Air_Pollution_Source_Apportionment/	4	Clean Air Asia – Air Quality in Asian Developing Countries Phase II	Development Agency	NA	F2F
84	Improved Cook Stove Construction, Promotion, and Dissemination Programme	https://www.cleanairinitiative.org/portal/node/1116/	25	Clean Air Asia – Rural Mutual Development (RMD) Nepal	Civil Society Organizations	NA	F2F
85	Fundamentals of Air Pollution Modelling and Application	https://www.cleanairinitiative.org/portal/node/1115/	5	Clean Air Asia – AIT	Research and Academia	NA	F2F

S. No.	Course Name	Course Link	Duration in Days	Organization Name	Organization Type	Assessment System	Delivery Mechanism
86	Four Gas and Diesel Smoke Analyzer	https://www.cleanairinitiative.org/portal/node/1114/	4	Clean Air Asia – Technical Training Agency, Indonesia (TTA – Indonesia)	Research and Academia	NA	F2F
87	Environmental Management	https://www.cleanairinitiative.org/portal/node/1113/	3	Clean Air Asia – Hanoi Department for Natural Resources, Environment and Housing (DONREH)	Regulatory/ Government Agency	NA	F2F
88	Emissions Examination Training for Mechanics and Students	https://www.cleanairinitiative.org/portal/node/1111/	4	Clean Air Asia – Pemerintah Kota Yogyakarta	Regulatory/ Government Agency	NA	F2F
89	Air Quality Communication	https://lms.learning-cleanairasia.org/catalog/info/id:129	Self-paced	Clean Air Asia – Integrated Programme for Better Air Quality in Asia	Development Agency	Guidance Area (GA) 4 Pre Test GA 4 Post Test GA 4: Exercises on Air Quality Communication	E-learning
90	Clean Air Action Plan	https://lms.learning-cleanairasia.org/catalog/info/id:130	Self-paced	Clean Air Asia – Integrated Programme for Better Air Quality in Asia	Development Agency	GA 6 Pre Test GA 6 Post Test GA 6: Exercises on Governance	E-learning
91	GA 6: Air Quality Governance	https://lms.learning-cleanairasia.org/catalog/info/id:131	Self-paced	Clean Air Asia – Integrated Programme for Better Air Quality in Asia	Development Agency	GA 6 Pre Test GA 6 Post Test GA 6: Exercises on Governance	E-learning
92	Urban Air Pollution in Asia Foundation Course on AQM in Asia	https://www.researchgate.net/publication/263970537_Urban_Air_Pollution_in_Asia_Foundation_Course_on_Air_Quality_Management_in_Asia	Self-paced	Stockholm Environment Institute (Alongside the University of York as a Part of the Clean Air for Asia Training Programme)	Research and Academia	NA	E-learning

S. No.	Course Name	Course Link	Duration in Days	Organization Name	Organization Type	Assessment System	Delivery Mechanism
93	Innovation Technologies AQM	https://events.development.asia/materials/20200122/innovation-technologies-air-quality-management	Self-paced	Development Asia – ADB Knowledgeable Events and Clarity Movement Co.	Development Agency	NA	E-learning
94	Monitoring of PM 2.5 and other Notified Air Pollutants as per Revised NAAQS 2009	https://cpcb.nic.in/openpdffile.php?id=TGF0ZXN0RmlsZS8yODB-fMTU3NjU3NzQyNV9tZWRpYXBo-b3RvODM5NS5wZGY=	5	CSIR – Indian Institute of Toxicology Research, Lucknow	Research and Academia	NA	F2F
95	AQM (Ambient and Source) and Continuous Ambient Air Quality Monitoring (CAAQM)	https://cpcb.nic.in/openpdffile.php?id=TGF0ZXN0RmlsZS8yODB-fMTU3NjU3NzQyNV9tZWRpYXBo-b3RvODM5NS5wZGY=	5	Post Graduate Institute of Medical Education and Research, Chandigarh	Research and Academia	NA	F2F/E-learning
96	Indoor and Outdoor Air Pollution, Standards and Impact on Human Health – Case Studies	https://cpcb.nic.in/openpdffile.php?id=TGF0ZXN0RmlsZS8yODB-fMTU3NjU3NzQyNV9tZWRpYXBo-b3RvODM5NS5wZGY=	3	Post Graduate Institute of Medical Education and Research, Chandigarh	Research and Academia	NA	F2F/E-learning

Note:
F2F: Physical training conducted face to face.
E-Learning: Online training program using web platforms.
E-Learning/F2F: A hybrid approach where participants receive learning resources/sessions in online mode, but practical sessions, doubt clearing sessions, or assessments are conducted in physical modes.

Annexure 2: Key Organizations in AQM and their Job Roles

1. Ministry of Environment, Forest and Climate Change[12]

The Ministry of Environment, Forest and Climate Change (MoEF&CC) is the nodal agency in the administrative structure of the Central Government for the planning, promotion, coordination, and overseeing of the implementation of India's environmental and forestry policies and programmes.

The broad objectives of the MoEF&CC are:

- Conservation and survey of flora, fauna, forests, and wildlife
- Prevention and control of pollution
- Afforestation and regeneration of degraded areas
- Protection of the environment
- Ensuring the welfare of animals

MoEF&CC has 19 regional offices, seven subordinate offices, five autonomous organizations, four boards and one institute to work for its objectives. One of these boards is the Central Pollution Control Board (CPCB).

Role of MoEF&CC in AQM

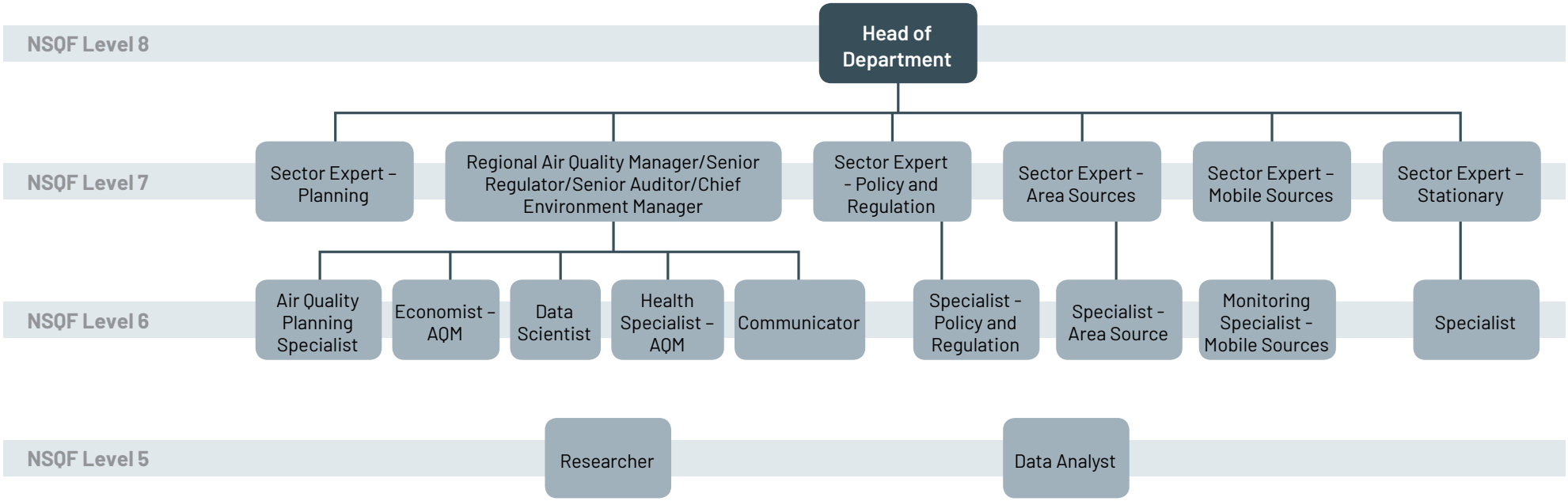
Sub-sector	Key Roles and Responsibilities
Ambient Air Quality (AAQ)	1. National AAQ monitoring framework 2. Financing AAQ monitoring stations 3. Publishing nationwide data on AAQ 4. Guidelines and policies for air pollution monitoring 5. Build a long-term observation network of urban/non-urban stations to plan regional-scale interventions to gain a scientific understanding of regional sources
Policy and Regulation	1. Developing national air quality policies and laws 2. Setting air quality regulations/standards and emission reduction targets in coordination with CPCB 3. Reviewing of regulations and policies 4. Coordination for proper implementation of the National Clean Air Programme (NCAP) 5. Coordination with other ministries and departments to strengthen NCAP 6. Directions to states and facilitating negotiations between states 7. Budgeting and financing for air quality 8. Providing a platform for stakeholder engagement on air pollution policy

Inventory, Modelling, and Forecasting	1. Facilitating and funding the setting up of a national data portal for: • Activity data from all emitting sectors • Measured emission factors from different technologies across all sectors • Operational air quality simulation • Model simulation output 2. Facilitate development and adoption of a robust, scale-agnostic intervention planning tool for rapid computations of policy simulations 3. Financing capacity building of State Pollution Control Boards (SPCBs) for generating quality, state-wise data on emissions and air quality and making it publicly available for researchers through websites
Audit, Inspection, and Enforcement	1. Inspection and compliance of environment compliance conditions 2. Overseeing the performance and implementation of NCAP 3. Setting up of regional cells to manage air pollution at a regional scale
Air Pollution Monitoring and Control – Area Sources	1. Policy coordination with different ministries – land, agriculture, Ministry of Petroleum and Natural Gas (MoPNG), Ministry of New and Renewable Energy (MNRE), Ministry of Housing and Urban Affairs (MoHUA) 2. Develop policy, programmes, and financing for land degradation and greening 3. Rules and regulations for waste management, construction, and mining sector 4. Coordinate with states on area sources
Air Pollution Monitoring and Control – Stationary Sources	1. Notify schemes and policies for compliance of stationary sources 2. Environmental clearance 3. Sector-wise emission standards and best practices 4. Promote technologies for monitoring and control
Air Pollution Monitoring and Control – Mobile Sources	1. Formulate national policies for vehicle standards, fuel quality, and inspection/enforcement regime 2. Coordinate policy decisions at the national level like the use of alternate fuels, periodic tightening of emission regulations, commitments at international forums, etc. 3. Coordinate with the Ministry of Heavy Industries and MoPNG to regulate the automobile sector
Air Quality Planning (Development of Action Plans – Sector/Regional Plans)	1. National-level air quality planning and review 2. Approval of sector, state, and city-level plans in coordination with CPCB 3. Set regional (airshed) and sectoral targets 4. Stakeholder engagement 5. Inter-state coordination

Job roles in MOEF&CC

S. No.	Sector/Sub-sector	Job Role	NSQF Level
1	Air Quality Management (AQM)	Head of Govt. Department/Commissioner of ULB/CEO of Company	8
2	Air Quality Planning	Sector Expert	7
3	Audit, Inspection, and Enforcement	Regional Air Quality Manager/Senior Regulator/Senior Auditor/Chief Environment Manager	7
4	Policy and Regulation	Sector Expert	7
5	Air Pollution Monitoring and Control – Mobile Source	Sector Expert	7
6	Air Pollution Monitoring and Control – Area Source	Sector Expert	7
7	Air Pollution Monitoring and Control – Stationary Source	Sector Expert	7
8	Policy and Regulation	Specialist	6
9	Economic/Finance	Economist - AQM	6
10	Health	Health Specialist - AQM	6
11	Air Quality Planning	Specialist	6
12	Air Pollution Monitoring and Control – Mobile Source	Specialist	6
13	Air Pollution Monitoring and Control – Area Source	Specialist	6
14	AQM	Data Scientist	6
15	AQM	Communicator	6
16	AQM	Researcher/Analyst	5
17	AQM	Data Analyst	5

AQM Occupational Map of Ministry of Environment, Forest & Climate Change



2. Department of Environment in States/UTs

Departments of Environment are a counterpart of the MoEF&CC in the states and UTs, with some degree of variations. They are responsible for the prevention and control of pollution and the conservation, management, and development of the state's/UT's environment and natural resources.

Role of Departments of Environment in AQM

Sub-sector	Key Roles and Responsibilities
AAQ	1. Development and financing of AAQ monitoring network in the state 2. Coordinating with SPCBs on AAQ monitoring quality assurance (QA) and quality control (QC) 3. Implementing central schemes/mandates on AAQ monitoring
Policy and Regulation	1. Setting state/district-level air quality (AQ) targets 2. Setting regulations on sectors/air pollution control areas, beyond the national standards 3. Implementing central schemes/mandates, adapting central schemes to meet requirements of the state, and identifying challenges of the state to suggest possible changes in the policy framework 4. Allocating budget for capacity building of sector departments under AQM

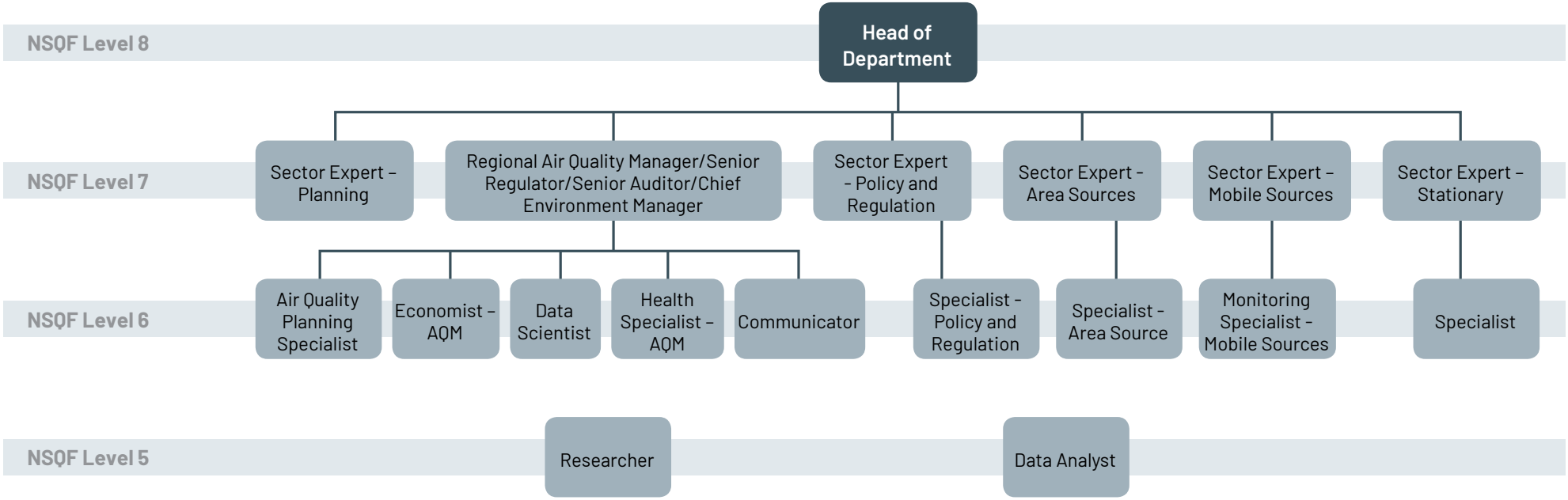
Inventory, Modelling, and Forecasting	1. Maintaining data records of area and mobile sources and non-formal stationary sources (residential biomass, biomass burning of fields and grasslands, waste burning), that are needed for both emission inventory and tracking implementation
Audit, Inspection, and Enforcement	1. Inspection and compliance of environment compliance conditions 2. Overseeing the performance and implementation of NCAP
Air Pollution Monitoring and Control – Area Sources	1. Formulation and regulation of policies through coordination with different departments – agriculture, land, public distribution system (PDS), urban affairs, and housing 2. Implement national policy and programmes on greening across states 3. Develop state-level policy and programme on greening 4. Develop and finance programmes for waste management and reducing pollution from stubble burning 5. Coordinate with ULBs and urban departments on implementing waste management rules and regulations 6. Develop policies and plans, including implementation of central plans, on land degradation
Air Pollution Monitoring and Control – Stationary Sources	1. Notify schemes and policies for compliance of stationary sources 2. Sector-wise emission standards and best practices 3. Policies and guidelines for industrial estates/special economic zones 4. Clean technology promotion 5. Cleaner fuel for industries
Air Pollution Monitoring and Control – Mobile Sources	1. Notify policies/standards/guidelines for setting up/operations of Pollution Under Control (PUC) centres 2. Formulation of public transport policy 3. Non-motorized transport policy and plans
Air Quality Planning (Development of Action Plans - Sector/Regional Plans)	1. Monitoring and implementation of city, regional, and state action plans 2. Overseeing state and city plan development 3. Set/review district-level/sectoral targets 4. Stakeholder engagement

Job roles in Departments of Environment in AQM

S. No.	Sector/Sub-sector	Job Role	NSQF Level
1	AQM	Head of Govt. Department/Commissioner of ULB/CEO of Company	8
2	Air Quality Planning	Sector Expert	7
3	Audit, Inspection, and Enforcement	Regional Air Quality Manager/Senior Regulator/Senior Auditor/Chief Environment Manager	7
4	Policy and Regulation	Sector Expert	7
5	Air Pollution Monitoring and Control – Mobile Source	Sector Expert	7
6	Air Pollution Monitoring and Control – Area Source	Sector Expert	7

7	Air Pollution Monitoring and Control – Stationary Source	Sector Expert	7
8	Policy and Regulation	Specialist	6
9	Economic/Finance	Economist - AQM	6
10	Health	Health Specialist - AQM	6
11	Air Quality Planning	Specialist	6
12	Air Pollution Monitoring and Control – Mobile Source	Specialist	6
13	Air Pollution Monitoring and Control – Area Source	Specialist	6
14	AQM	Data Scientist	6
15	AQM	Communicator	6
16	AQM	Researcher/Analyst	5
17	AQM	Data Analyst	5

AQM Occupational Map of Department of Environment in States/UTs



3. Central Pollution Control Board (CPCB)[13]

The functions of CPCB are specified under different Acts and rules, such as the Water (Prevention and Control of Pollution) Act, 1974 and Air (Prevention and Control of Pollution) Act, 1981. Some additional responsibilities are assigned by the MoEF&CC under the Environment (Protection) Act, 1986. The activities of CPCB are broadly classified into seven categories:

i). Technical assistance and advisory

ii). Regulatory functions

iii). Data and information management

iv). Knowledge dissemination and awareness

v). Research and development

vi). Legislation and action plans

vii). Coordination with other stakeholders

The roles and functions of CPCB are as follows:

- Advise the Central Government on matters concerning prevention and control of water and air pollution and improvement of air quality.
- Plan and cause to be executed a nationwide programme for the prevention, control or abatement of water and air pollution.
- Coordinate the activities of the state boards and resolve disputes among them.
- Provide technical assistance and guidance to the state boards and carry out/sponsor investigation and research relating to the problems of water and air pollution, their prevention, control, or abatement.
- Plan and organise trainings for persons engaged in the programmes on prevention, control, or abatement of water and air pollution.
- Organize a comprehensive mass awareness programme, through mass media, on the prevention, control, or abatement of water and air pollution.
- Collect, compile, and publish technical and statistical data relating to water and air pollution and the measures devised for its effective prevention, control, or abatement.
- Prepare manuals, codes, and guidelines relating to the treatment and disposal of sewage and trade effluents and for stack gas cleaning devices, stacks, and ducts.
- Disseminate information regarding matters relating to water and air pollution and their prevention and control.
- Lay down, modify, or annul, in consultation with the concerned state governments, the standards for streams/wells and the quality of air.
- Perform such other functions as may be prescribed by the Government of India.

The headquarter of CPCB is located in New Delhi. CPCB also has nine regional offices in Bhopal, Bengaluru, Lucknow, Kolkata, Vadodara, Chennai, Pune, Chandigarh, and Shillong and one project office in Agra.

Role of Central Pollution Control Board in AQM

Sub-sector	Key Roles and Responsibilities
AAQ	1. Development of a nationwide programme for monitoring 2. QA/QC guidelines on AAQ 3. Plan and develop national monitoring networks 4. Capacity building of SPCBs on monitoring 5. Monitoring of the CAAQMS information from across the country 6. Monitoring AAQ
Policy and Regulation	1. Developing long-term road maps for sectoral emissions and AAQ improvements 2. Building the capacity of SPCBs and other stakeholders to understand and implement policies/regulations 3. Developing policies, standards, guidelines, and regulations 4. Developing standards for noise pollution
Inventory, Modelling, and Forecasting	1. Development and maintenance of data portals for: (i) Activity data from all emitting sectors for updating emission inventory on an annual basis – power, industry, transport, bricks, agricultural processing, chemicals, and heavy industry (ii) Measuring emission factors from formal and informal industry (including chemical speciation) 2. Development of SOPs/standards/guidelines for data capture, sharing, analysis, and data security 3. Capacity building of relevant stakeholders for handling datasets
Audit, Inspection, and Enforcement	1. Implementing and ensuring compliance with policies, guidelines, and regulations 2. Inspecting the industry for compliance assurance 3. Developing SOPs for audit, inspection, and enforcement
Air Pollution Monitoring and Control – Area Sources	1. Developing and monitoring regulations on waste, construction, and mining sector 2. Supporting other ministries in developing standards for monitoring and control of area sources
Air Pollution Monitoring and Control – Stationary Sources	1. Monitoring the CEMS information from industries across the country and enforcing the relevant compliances 2. Monitoring and regulating industrial pollution 3. Conducting source apportionment (SA) study and inspection 4. Developing policies, standards, guidelines, and regulations for monitoring and control of emissions from stationary sources like industries 5. Ensuring compliance and enforcement of emission standards at stationary sources 6. Framing air quality and industrial emissions standards in coordination with MoEF&CC 7. Reviewing data from monitoring stations and Air Pollution Control Devices (APCDs) at the country level
Air Pollution Monitoring and Control – Mobile Sources	1. Developing policies, standards, guidelines, and regulations for monitoring and control of mobile source emissions 2. Ensuring compliance and enforcement of emission standards from mobile sources 3. Framing air quality and mobile source emissions standards in coordination with MoEF&CC 4. Reviewing data from monitoring stations and APCD at the country level

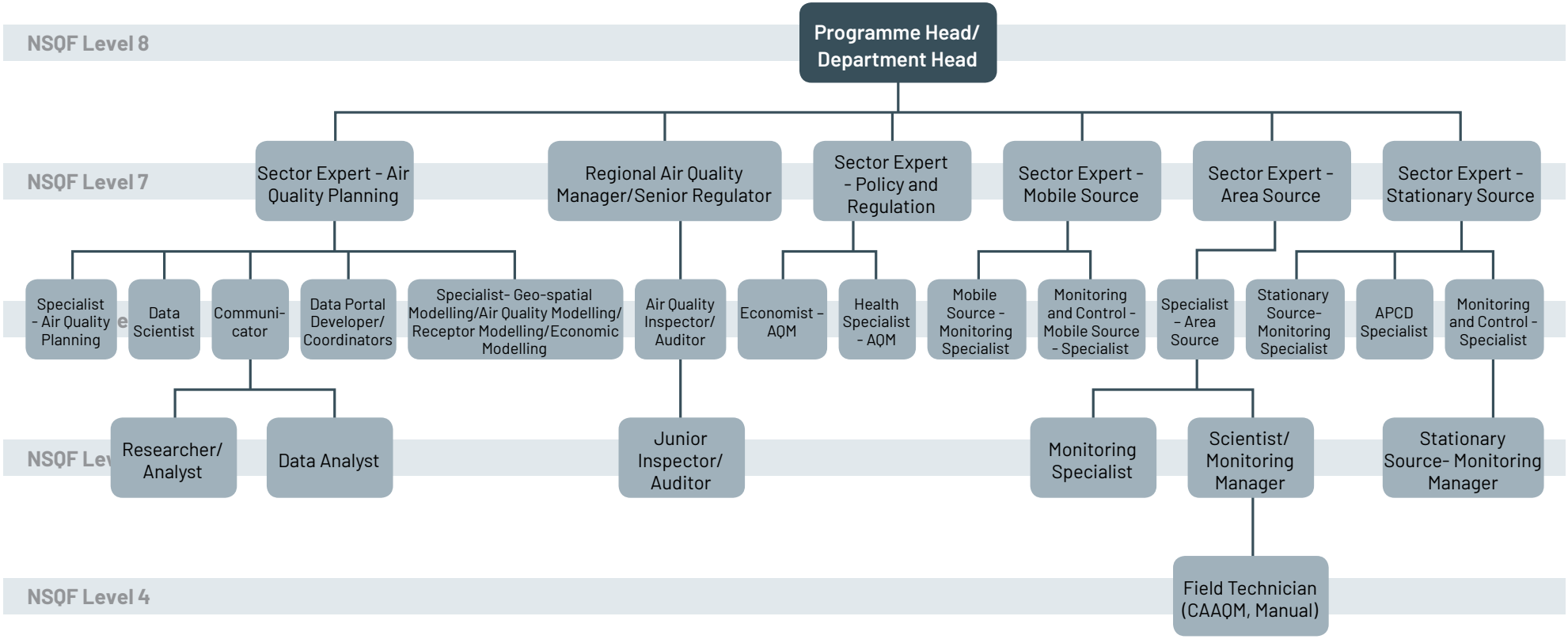
Air Quality Planning (Development of Action Plans - Sector/Regional Plans)	1. Fund projects/Conduct studies for planning air quality improvement 2. Validation of sectoral plans 3. Development and validation of regional, state, district, and/or city plans 4. Oversee implementation of action plans

Job roles in Central Pollution Control Board in AQM

S. No.	Sector/Sub-sector	Job Role	NSQF Level
1	AQM	Programme Head/Project Head/Department Head	8
2	Air Quality Planning	Sector Expert	7
3	Audit, Inspection, and Enforcement	Regional Air Quality Manager/Senior Regulator/Senior Auditor/Chief Environment Manager	7
4	Policy and Regulation	Sector Expert	7
5	Air Pollution Monitoring and Control – Mobile Source	Sector Expert	7
6	Air Pollution Monitoring and Control – Area Source	Sector Expert	7
7	Air Pollution Monitoring and Control – Stationary Source	Sector Expert	7
8	Air Pollution Monitoring and Control – Stationary Source	Monitoring Specialist	6
9	AAQ Monitoring	Monitoring Specialist	6
10	Air Pollution Monitoring and Control – Mobile Source	Monitoring Specialist	6
11	Air Pollution Monitoring and Control – Stationary Source	APCD Specialist	6
12	Policy and Regulation	Specialist	6
13	Economic/Finance	Economist - AQM	6
14	Health	Health Specialist - AQM	6
15	Inventory, Modelling, and Forecasting	Data Portal Developer/Coordinators	6
16	Inventory, Modelling, and Forecasting	Specialist • Geo-spatial Modelling • Air Quality Modelling • Receptor Modelling • Economic Modelling	6
17	Air Quality Planning	Specialist	6
18	Air Pollution Monitoring and Control – Mobile Source	Specialist	6
19	Air Pollution Monitoring and Control – Stationary Source	Specialist	6

20	Air Pollution Monitoring and Control – Area Source	Specialist	6
21	AQM	Data Scientist	6
22	AQM	Communicator	6
23	Audit, Inspection, and Enforcement	Air Quality Inspector/Auditor	6
24	Air Pollution Monitoring and Control – Stationary Source	Monitoring Manager	5
25	AAQ Monitoring	Lab Scientist/Monitoring Manager	5
26	AQM	Researcher/Analyst	5
27	AQM	Data Analyst	5
28	Audit, Inspection, and Enforcement	Junior Inspector/Auditor	5
29	AAQ Monitoring	Field Technician (CAAQM, Manual)	4

AQM Occupational Map of Central Pollution Control Board



4. State Pollution Control Boards/Pollution Control Committees of the Union Territories

There are 29 SPCBs and six pollution control committees (PCCs) in India. Their functions are specified under different Acts and rules, such as the Water (Prevention and Control of Pollution) Act, 1974 and Air (Prevention and Control of Pollution) Act, 1981.

The major functions of SPCB/PCC are[14]:

- To plan a comprehensive programme for the prevention, control, and abatement of water and air pollution.
- To advise the state government on any matter concerning the prevention, control, or abatement of water and air pollution.
- To collect and disseminate information relating to water and air pollution and the prevention, control, or abatement thereof.
- To inspect sewage and trade effluent treatment plants for their effectiveness and review plans and specifications for corrective measures.
- To inspect industrial plants, manufacturing processes, and control equipment and to give directions to take steps for the prevention, control, or abatement of air pollution.
- To inspect air pollution control areas for assessment of the quality of air therein and to take steps for the prevention, control, or abatement of air pollution in such areas.
- To lay down, modify, or annul effluent standards for the sewage and trade effluents and the emission of air pollutants into the atmosphere from industrial plants and automobiles or for the discharge of any air pollutant into the atmosphere from any other source.
- To evolve the best economically viable treatment technology for sewage and trade effluents.
- To collect samples of sewage and trade effluents and emissions of air pollutants and to analyze the same for specific parameters.
- To collaborate with the CPCB in organizing the training of persons engaged or to be engaged in programmes relating to the prevention, control, or abatement of water and air pollution and to organize relevant mass education programmes.
- To perform such other functions as may be prescribed by the state government or CPCB.

Role of State Pollution Control Board in AQM

Sub-sector	Key Roles and Responsibilities
AAQ	1. Development of a state-wide programme on monitoring 2. QA/QC guidelines on AAQ 3. Plan and develop state monitoring networks 4. Capacity building of SPCBs and other stakeholders on monitoring 5. Monitoring AAQ over a periodic and daily basis
Policy and Regulation	1. Developing an implementation framework based on policies and regulations 2. Developing state and region-specific long-term road maps for sectoral emissions and AAQ improvements 3. Coordination with the DOEs in the states/UTs for formulation and implementation of policies 4. Executing orders issued by the ministry/CPCB, collecting data pertaining to the performance of polluting assets, giving consent to operate/establish industry, and issuing environmental clearance 5. Advising state governments on policies and regulations 6. Building the capacity of SPCBs and other stakeholders to understand and implement policies/regulations

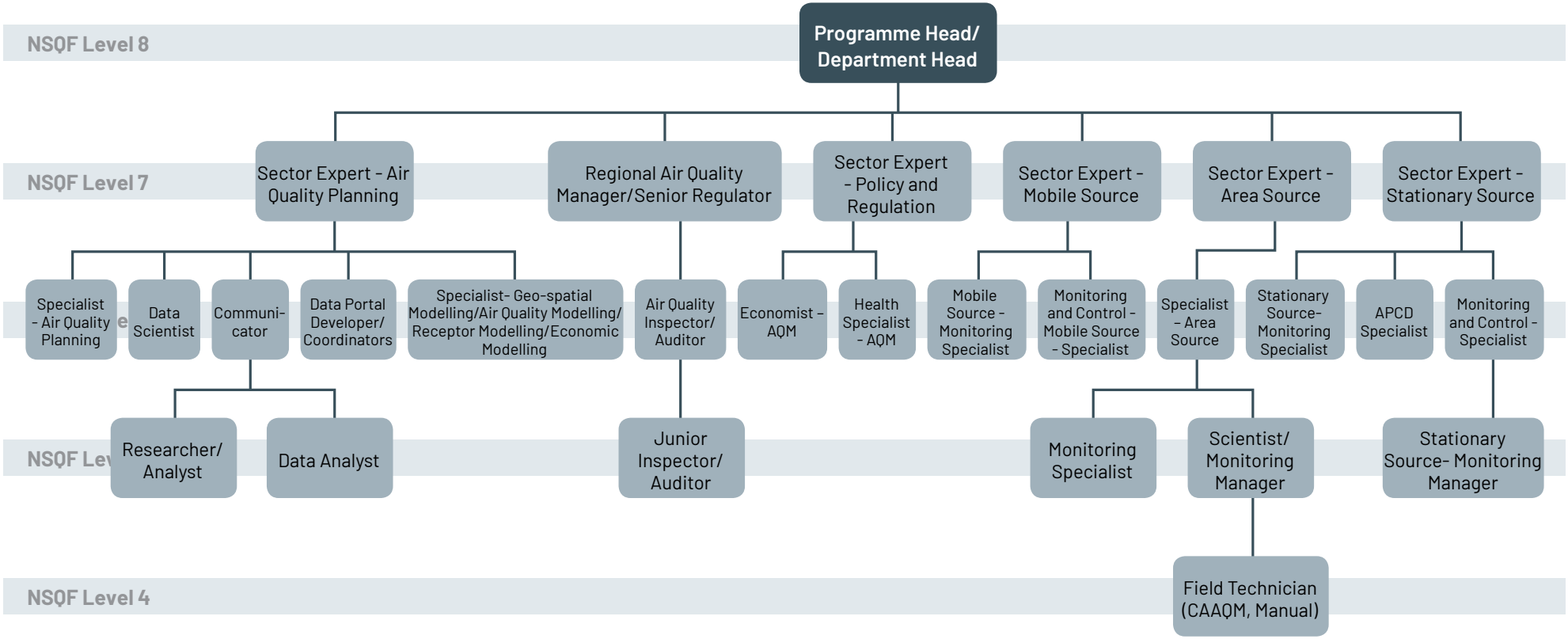
	7. Coordinate with ULBs as per the direction of CPCB for capacity building on policy implementation 8. Conduct studies for planning air quality improvement 9. Connect with IoRs, and ULBs to generate a database on the actions taken toward improving air quality
Inventory, Modelling, and Forecasting	1. Building emission inventories 2. Maintaining a database of 3-monthly SA across sites 3. Provision of data for inventory, modelling, and forecasting 4. Coordination with ULBs to update the portal with data 5. Develop capacity building of relevant stakeholders for handling datasets 6. Developing road map for sectors and new technologies
Audit, Inspection, and Enforcement	1. Develop SOPs for audit, inspection, and enforcement in states 2. Implement and ensure compliance with policies, guidelines, and regulations 3. Inspect the industry for compliance assurance 4. Coordination with ULBs, IoRs, NGOs, and academic institutions to monitor, inspect, and ensure compliance
Air Pollution Monitoring and Control – Area Sources	1. Develop, monitor, and enforce regulations on the waste, construction, and mining sector 2. Identifying local-level air pollution area sources 3. Running SA models 4. Support other state departments in developing standards for monitoring and control of area sources
Air Pollution Monitoring and Control – Stationary Sources	1. Conduct state-level SA study 2. Develop policies, standards, guidelines, and regulations for emissions from stationary sources in states 3. Ensure compliance and enforcement of emission standards at stationary sources at the state level 4. Monitoring the CEMS information from the industries in the state, compliance enforcement 5. Monitoring and regulating state and region-specific industrial pollution
Air Pollution Monitoring and Control – Mobile Sources	1. Implement policies and programmes for controlling vehicular emissions through PUC units 2. Conduct studies for alternative fuels for mobile sources 3. Monitoring the emissions in the state from mobile sources, compliance enforcement
Air Quality Planning (Development of Action Plans - Sector/Regional Plans)	1. Development and validation of state-level plans 2. Implementation of the mitigation plan at the state level 3. Translate national goals into state/local action plans 4. Validations of district plans 5. Validation of city plans 6. Provide feedback and directions 7. Oversee implementation of state/district/city action plans

Job roles in State Pollution Control Board in AQM

S. No.	Sector/Sub-sector	Job Role	NSQF Level
1	AQM	Programme Head/Project Head/Department Head	8
2	Air Quality Planning	Sector Expert	7
3	Audit, Inspection, and Enforcement	Regional Air Quality Manager/Senior Regulator/Senior Auditor/Chief Environment Manager	7
4	Policy and Regulation	Sector Expert	7
5	Air Pollution Monitoring and Control – Mobile Source	Sector Expert	7
6	Air Pollution Monitoring and Control – Area Source	Sector Expert	7
7	Air Pollution Monitoring and Control – Stationary Source	Sector Expert	7
8	Air Pollution Monitoring and Control – Stationary Source	Monitoring Specialist	6
9	AAQ Monitoring	Monitoring Specialist	6
10	Air Pollution Monitoring and Control – Mobile Source	Monitoring Specialist	6
11	Air Pollution Monitoring and Control – Stationary Source	APCD Specialist	6
12	Policy and Regulation	Specialist	6
13	Economic/Finance	Economist - AQM	6
14	Health	Health Specialist - AQM	6
15	Inventory, Modelling, and Forecasting	Data Portal Developer/Coordinators	6
16	Inventory, Modelling, and Forecasting	Specialist • Geo-spatial Modelling • Air Quality Modelling • Receptor Modelling • Economic Modelling	6
17	Air Quality Planning	Specialist	6
18	Air Pollution Monitoring and Control – Mobile Source	Specialist	6
19	Air Pollution Monitoring and Control – Stationary Source	Specialist	6
20	Air Pollution Monitoring and Control – Area Source	Specialist	6
21	AQM	Data Scientist	6
22	AQM	Communicator	6
23	Audit, Inspection, and Enforcement	Air Quality Inspector/Auditor	6
24	Air Pollution Monitoring and Control – Stationary Source	Monitoring Manager	5

25	AAQ Monitoring	Lab Scientist/Monitoring Manager	5
26	AQM	Researcher/Analyst	5
27	AQM	Data Analyst	5
28	Audit, Inspection, and Enforcement	Junior Inspector/Auditor	5
29	AAQ Monitoring	Field Technician (CAAQM, Manual)	4

AQM Occupational Map of State Pollution Control Boards/Committees



5. Urban Local Bodies

ULBs are small local bodies that administer or govern a city or a town. The major functions of ULBs relate to public health, welfare, regulatory functions, public safety, public infrastructure works, and development activities. Municipal corporations, municipalities, town area committees, townships, port trusts, and cantonment boards are some of the ULBs in India. Following are the number[15] of various ULBs present in India:

S. No.	ULB Category	Number
1	Municipal Corporation	206
2	Municipal Councils/Municipality[16]	1,683
3	Nagar Panchayat[17] (Town Municipal Councils, Small Town Committees, Town Councils, Notified Area Committees)	2,411

Role of Urban Local Bodies in AQM

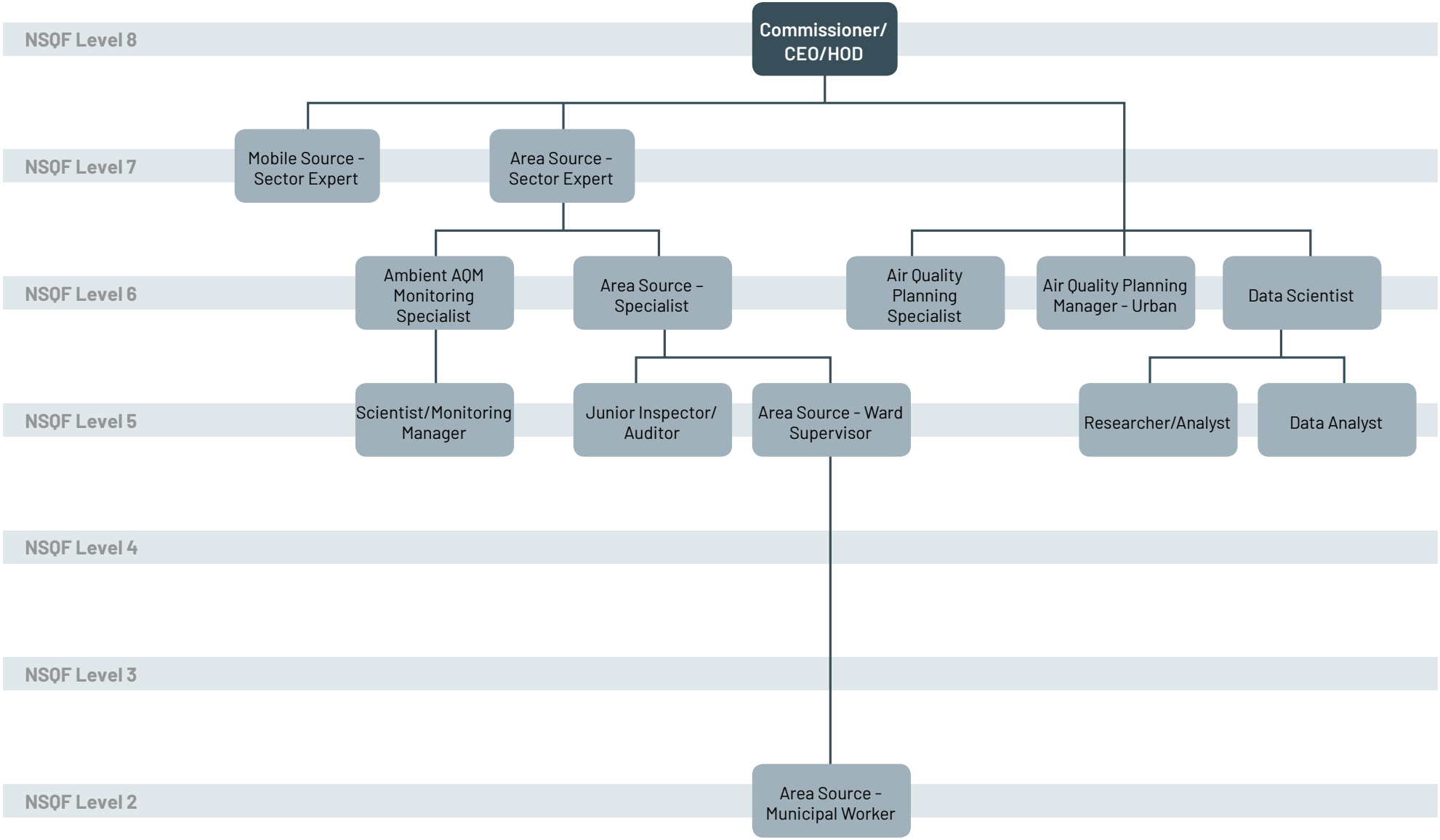
Sub-sector	Key Roles and Responsibilities
AAQ	1. Setting up of monitoring stations 2. Ensure healthy AAQ
Policy and Regulation	1. Linking AQM with broader development pathways 2. Strategic local area interventions 3. Identification of challenges in service delivery and integrated command and control 4. Stakeholder engagement 5. Feedback on existing policies 6. Regulate and ensure compliance enforcement/provide certification to various implementing authorities at the city level
Inventory, Modelling, and Forecasting	1. Coordinate and provide support to NGOs/Think Tanks for the inventorization of AQM sources
Audit, Inspection, and Enforcement	1. Identifying local sources and engaging in the enforcement of sources under their jurisdiction 2. Implementation of mitigation plans
Air Pollution Monitoring and Control – Area Sources	1. Develop and implement a dust management plan, building by-laws on construction dust and greening plan 2. Inspection and enforcement – construction and demolition (C&D) waste, open burning, garbage 3. Control waste burning 4. Monitor and report any violations 5. Maintain and update data on the dust and waste-producing activities via a portal 6. Proper disposal and treatment of waste at landfill sites 7. Put restrictions on open dumping of waste 8. Development of waste dumping sites into parks/for recreational use/for a useful purpose.

Air Pollution Monitoring and Control – Stationary Sources	1. Conduct inspection of industrial for non-compliance 2. Ensure compliance of stationary sources 3. Promote clean fuel 4. Restrict biomass and solid fuel burning
Air Pollution Monitoring and Control – Mobile Sources	1. Ensure good-quality city roads to reduce vehicular emissions 2. Conceive and implement municipal-level control strategies (e.g., LEZ, TOD, mode-shift, parking, urban fleet renewal, etc.) 3. Congestion management, improve public transport services, promote non-motorized transport and improve road infrastructure
Air Quality Planning (Development of Action Plans - Sector/Regional Plans)	1. Develop city action plans 2. Integrate AQM into long-term master plans of cities 3. Initiating short-term actions 4. Identify local issues, formulate action plans, and take remedial actions 5. Develop mitigation plans 6. Create awareness by engaging NGOs and Think Tanks

Job roles in Urban Local Bodies in AQM

S. No.	Sector/Sub-sector	Job Role	NSQF Level
1	AQM	Head of Govt. Department/Commissioner of ULB/CEO of Company	8
2	Air Pollution Monitoring and Control – Mobile Source	Sector Expert	7
3	Air Pollution Monitoring and Control – Area Source	Sector Expert	7
4	AAQ Monitoring	Monitoring Specialist	6
5	Air Quality Planning	Specialist	6
6	Air Pollution Monitoring and Control – Area Source	Specialist	6
7	AQM	Data Scientist	6
8	Air Quality Planning	Air Quality Manager - Urban	6
9	AAQ Monitoring	Lab Scientist/Monitoring Manager	5
10	AQM	Researcher/Analyst	5
11	AQM	Data Analyst	5
12	Audit, Inspection, and Enforcement	Junior Inspector/Auditor	5
13	Air Pollution Monitoring and Control – Area Source	Ward Supervisor	5

AQM Occupational Map of Urban Local Bodies



6. Institutes of Repute

As part of the NCAP, the National Knowledge Network (NKN) has identified knowledge partners and guide them for the abatement of air pollution in over 100 non-attainment cities. These knowledge partner institutes, known as Institutes of Repute (IORs), primarily provide technical and scientific support for the clean air project to cities[18].

Roles and responsibilities of IoRs:

1. To extend all necessary knowledge-based support to the SPCBs and ULBs.
2. Undertake air quality monitoring work, data analysis, data utilization, data compilation, and adherence to interpretation protocols and report preparation.
3. Calibration of CAAQMS, compliance verification work of emission norms as a third-party assessment (TPA) to provide independent input to SPCBs and policymakers.
4. Focus on the efficacy and efficiency of various measures including assessment of the cost-benefit analysis.

List of some key IoRs:

1. NEERI, Nagpur	2. IITM, Pune	3. IIT Kanpur	4. IIT Delhi	5. IIT Madras	6. IIT Guwahati	7. BARC, Mumbai	8. PCRI Haridwar	9. NIOH Hyderabad	10. CSIR-CRRI, New Delhi
11. CIRT, New Delhi	12. IRADe, New Delhi	13. CPR New Delhi	14. NIPFP New Delhi	15. NPL New Delhi	16. iFOREST	17. IIM Lucknow	18. Bengal Engineering and Sciences Institute	19. BHU	20. TERI University

Role of Institutes of Repute in AQM

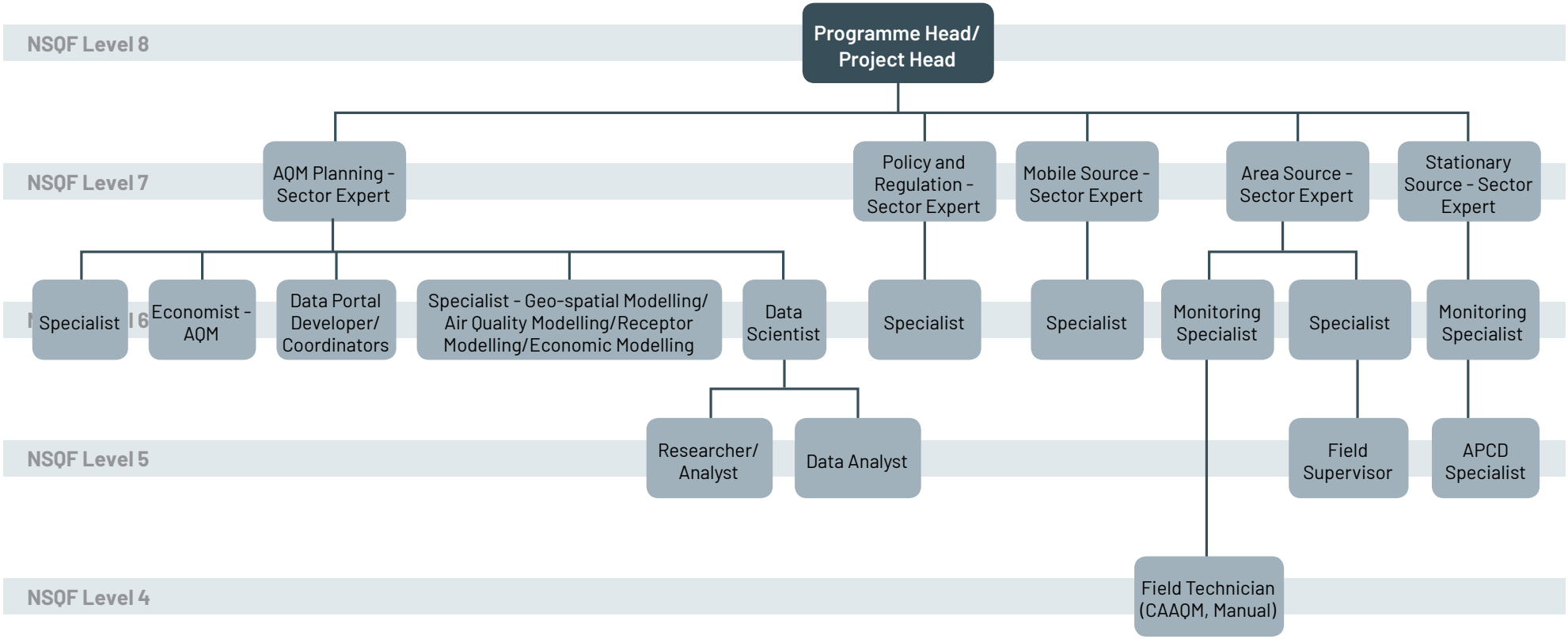
Sub-sector	Key Roles and Responsibilities
AAQ	1. Design AQM processes for AAQ 2. Research and develop new technologies for monitoring and control
Policy and Regulation	1. Serve as a platform to guide states/cities on the development of policy pathways 2. Support in understanding the infrastructure and cost involved in implementing policies 3. Work with municipalities and larger airsheds to identify potential policy/regulatory programmes and implementation modalities that can move toward achieving Air Quality (AQ) goals/objectives 4. Evaluate the implementation of policy at the state/local level 5. Air quality trend analysis for policy recommendations 6. Sharing best practices for replication 7. Building capacity in SPCBs, ULBs, other implementing organizations, and line departments of sectors contributing to emissions of various air pollutants
Inventory, Modelling, and Forecasting	1. Carry out modelling studies – researching and developing methodologies and models for inventory, modelling, and forecasting. 2. Prepare air quality profiles to be available for SPCBs, ULBs, etc.

	3. Provide technical inputs to SPCBs as per the action plan given by CPCB 4. Cost-effectiveness analysis 5. Data analysis of implementation and related AQ changes 6. Keep up with international technologies and developments 7. Develop latest technologies and help with training facilities for technical stakeholders 8. Offering scientific and technical assistance on innovative systems and solutions
Audit, Inspection, and Enforcement	1. Third-party audit of cities and industries 2. Conduct emission control studies and third-party inspections 3. Develop digital interactive tools – implementation planning/tracking
Air Pollution Monitoring and Control – Area Sources	1. Support ULBs in developing and implementing plans to reduce dust emissions and waste management 2. Developing plans on greening including micro plans on dust, waste and biomass 3. Research the contribution and mitigation of area sources 4. Support in SA studies
Air Pollution Monitoring and Control – Stationary Sources	1. Support ULBs in developing and implementing plans to reduce industrial emissions and emissions from other stationary sources 2. Monitoring source emissions in periodic intervals 3. Data collection on stationary source emissions 4. Support in SA studies
Air Pollution Monitoring and Control – Mobile Sources	1. Translating national vehicle policy into action plans and implementing strategies 2. Support ULBs on prioritization of control actions pertaining to the mobile sector 3. Conduct vehicular emission modelling and inventory-related research 4. IoRs like IITs may develop solutions for equipment manufacturing to control pollution from mobile sources 5. Support in SA studies
Air Quality Planning (Development of Action Plans - Sector/Regional Plans)	1. Devising region-specific interventions 2. Aid CPCB/SPCBs in the development of an air pollution mitigation framework to provide inputs regarding mitigation strategies that lead to a quantitative and qualitative reduction in air pollution which would be observed when implemented 3. Supporting the development of action plans for cities and prioritizing the action plans/policies for implementation 4. Awareness generation programmes to educate people about the issue of air pollution and aid behavioural change 5. Impact assessment framework to link intervention to air quality changes 6. Recommend region-specific control technologies backed by research 7. Identify scalable solutions and share best practices 8. Decision support system and knowledge sharing platform

Job roles in Institutes of Repute in AQM

S. No.	Sector/Sub-sector	Job Role	NSQF Level
1	AQM	Programme Head/Project Head/Department Head	8
2	Air Quality Planning	Sector Expert	7
3	Policy and Regulation	Sector Expert	7
4	Air Pollution Monitoring and Control – Mobile Source	Sector Expert	7
5	Air Pollution Monitoring and Control – Area Source	Sector Expert	7
6	Air Pollution Monitoring and Control – Stationary Source	Sector Expert	7
7	Air Pollution Monitoring and Control – Stationary Source	Monitoring Specialist	6
8	AAQ Monitoring	Monitoring Specialist	6
9	Air Pollution Monitoring and Control – Stationary Source	APCD Specialist	6
10	Policy and Regulation	Specialist	6
11	Economic/Finance	Economist – AQM	6
12	Inventory, Modelling, and Forecasting	Data Portal Developer/Coordinators	6
13	Inventory, Modelling, and Forecasting	Specialist • Geo-spatial Modelling • Air Quality Modelling • Receptor Modelling • Economic Modelling	6
14	Air Quality Planning	Specialist	6
15	Air Pollution Monitoring and Control – Mobile Source	Specialist	6
16	Air Pollution Monitoring and Control – Area Source	Specialist	6
17	AQM	Data Scientist	6
18	AQM	Researcher/Analyst	5
19	AQM	Data Analyst	5
20	Air Pollution Monitoring and Control – Area Source	Field Supervisor	5
21	AAQ Monitoring	Field Technician (CAAQM, Manual)	4

AQM Occupational Map of Institutes of Repute (IoRs)



7. Other Academic and Research Institutes

All academic institutes/research institutes/organizations/individuals involved in the monitoring and analysis of pollution and conducting research on the environmental, economic, and health impacts of pollution to find solutions are categorized as "other academic and research institutes". These institutes enrich AQM sector with knowledge in technical, health and policy-related fields. Currently, these institutions do not have the required credentials to be termed as IoRs.

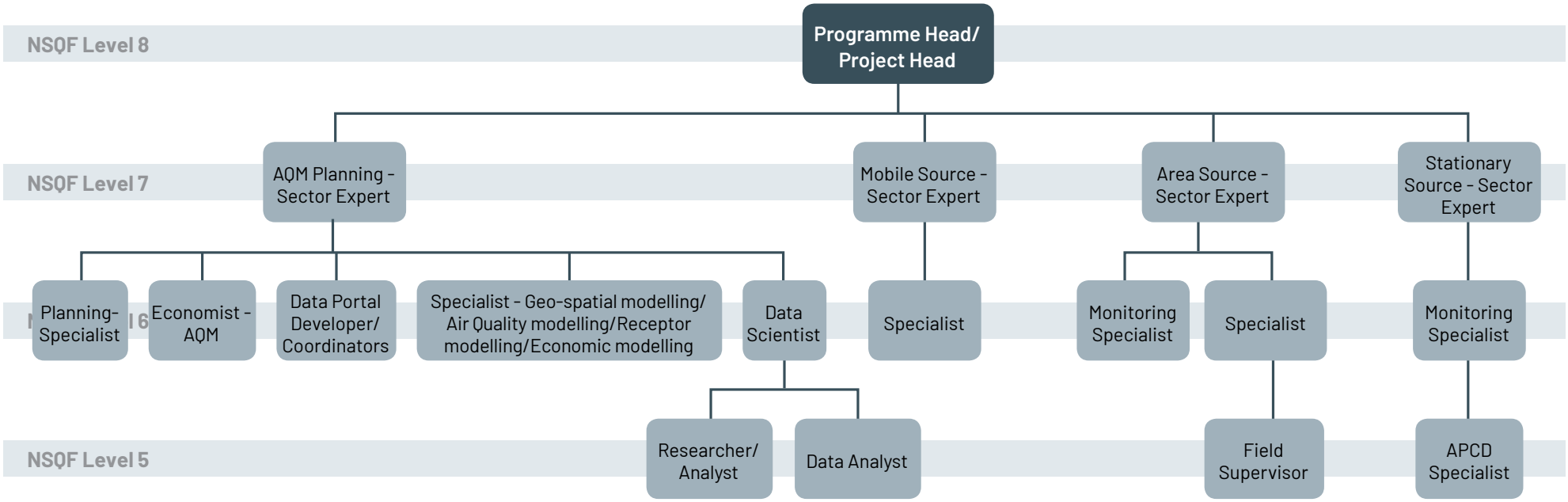
Role of Other Academic and Research Institutes in AQM

Sub-sector	Key Roles and Responsibilities
AAQ	1. Regular collection and reviewing of data from monitoring stations 2. Publishing monitoring data over periodic intervals 3. Research and data analysis on AAQ 4. Data collection on ground from CAAQM and manual stations
Policy and Regulation	1. Identifying potential areas of intervention, assessing the social impacts of policy interventions, and identifying alternative approaches to AQM 2. Academic research on the effectiveness of both existing and potential policy/regulations 3. Data analysis for policy recommendations 4. Research on policy and regulations
Inventory, Modelling, and Forecasting	1. Developing sectoral methodologies for emission inventories 2. Optimizing chemical transport modelling (CTM) for better AQ simulation 3. Developing expanded receptor model techniques for resolving similar sources 4. Research activities on the health effects of air pollution 5. Data collection and analysis to understand ground realities 6. Designing a more in-depth curriculum for students to better understand applicability that includes learning modelling and forecasting techniques
Audit, Inspection, and Enforcement	
Air Pollution Monitoring and Control – Area Sources	1. Consult and suggest remedial actions 2. Investigate unconventional issues 3. Undertake analysis of primary research on contribution and mitigation of area sources 4. Undertake primary field research on identifying area sources
Air Pollution Monitoring and Control – Stationary Sources	1. Assessment of select APCDs and assessment of emissions 2. Monitoring select APCDs performance and emission from identified sources 3. Data collection using APCD
Air Pollution Monitoring and Control – Mobile Sources	1. Research on the role of vehicle emissions in overall air pollution challenges (SA, CTMs, inventory improvement, etc.) 2. Publish research papers on data collected from field implementations
Air Quality Planning (Development of Action Plans - Sector/Regional Plans)	1. Conduct human impact assessments with a focus on justice aspects for context-specific plans 2. Conduct social impact assessments to propose action items 3. Awareness generation

Job roles in Other Academic and Research Institutes in AQM

S. No.	Sector/Sub-sector	Job Role	NSQF Level
1	AQM	Programme Head/Project Head/Department Head	8
2	Air Quality Planning	Sector Expert	7
3	Air Pollution Monitoring and Control – Mobile Source	Sector Expert	7
4	Air Pollution Monitoring and Control – Area Source	Sector Expert	7
5	Air Pollution Monitoring and Control – Stationary Source	Sector Expert	7
6	Air Pollution Monitoring and Control – Stationary Source	Monitoring Specialist	6
7	AAQ Monitoring	Monitoring Specialist	6
8	Air Pollution Monitoring and Control – Stationary Source	APCD Specialist	6
9	Policy and Regulation	Specialist	6
10	Economic/Finance	Economist - AQM	6
11	Health	Health Specialist - AQM	6
12	Inventory, Modelling, and Forecasting	Data Portal Developer/Coordinators	6
13	Inventory, Modelling, and Forecasting	Specialist • Geo-spatial Modelling • Air Quality Modelling • Receptor Modelling • Economic Modelling	6
14	Air Quality Planning	Specialist	6
15	Air Pollution Monitoring and Control – Mobile Source	Specialist	6
16	Air Pollution Monitoring and Control – Area Source	Specialist	6
17	AQM	Data Scientist	6
18	AQM	Researcher/Analyst	5
19	AQM	Data Analyst	5
20	Air Pollution Monitoring and Control – Area Source	Field Supervisor	5

AQM Occupational Map of Other Academic and Research Institutes



8. NGOs/Think Tanks

Any independent organization involved in conducting emission inventory, modelling, forecasting, permit, inspection, enforcement, providing suggestions to develop policy plans and regulations, conducting impact assessments, or hosting air pollution sector experts falls under the category of NGOs and think tanks.

Following are the some of the active NGOs and think tanks in India:

1. Public Health Foundation of India (PHFI)	2. Centre for Environment Education (CEE)	3. Observer Research Foundation (ORF)
4. Chintan Environmental Research and Action Group	5. Centre for Science and Environment	6. Development Alternatives
7. Centre for Study of Science, Technology and Policy (CSTEP)	8. The Automotive Research Association of India (ARAI)	9. Air Pollution Action Group (A-PAG)
10. Urban Emissions	11. Energy Policy Institute at the University of Chicago (EPIC India)	12. Council on Energy, Environment, and Water (CEEW)
13. The Energy & Resource Institute (TERI)	14. Centre for Policy Research (CPR)	15. EMRTC private consultant
16. Lung Care Foundation	17. iFOREST	

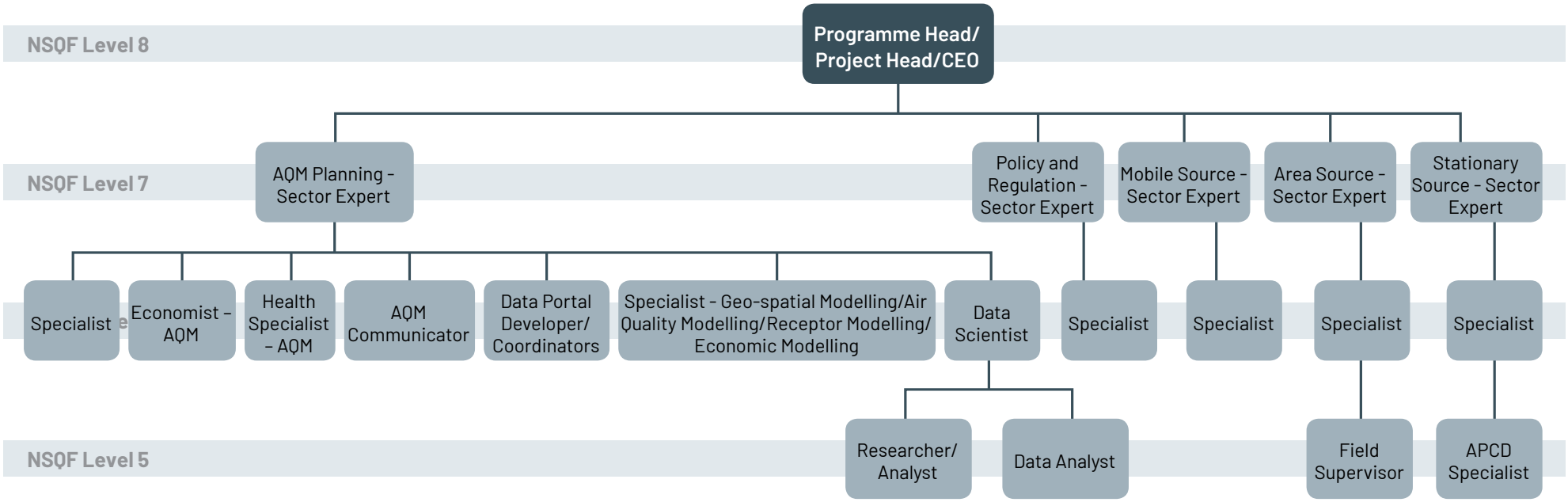
Role of NGOs/Think Tanks in AQM

Sub-sector	Key Roles and Responsibilities
AAQ	1. Conduct research on AAQ
Policy and Regulation	1. Identify and assess the policy gaps through policy evaluations/analysis including carrying out scientific studies 2. Identify and suggest alternative policy measures, solutions 3. Support national and local regulators in developing approaches to AQM 4. Communicate research outputs and policy findings to the govt. bodies/policymakers for improving the existing rules and regulations or forming new policies 5. Advocate for the use of new tools and techniques to enhance policy implementation, regulation, and enforcement 6. Facilitate other institutions by providing public opinions on regulations and their implementation, and make policymakers aware of ground realities 7. Advocate for better policies and programs 8. Facilitate Resident Welfare Associations (RWAs) in proper waste collection, treatment, and disposal through trainings and capacity building programmes 9. Capacity building of all stakeholders, on scalable or replicable technologies 10. Review of past initiatives – what has worked and what has not
Inventory, Modelling, and Forecasting	1. Increase awareness 2. Act as a bridge between policy and modelling 3. Run reduced-form models 4. Conduct SA studies 5. Quantitative and qualitative impact assessment for mitigation practices 6. Influencing behavioural change, EI (Environmental Intelligence) modelling, cost-effectiveness analysis 7. Air quality trend analysis
Audit, Inspection, and Enforcement	1. Providing operational support to implementing agencies 2. Conduct third-party audits
Air Pollution Monitoring and Control – Area Sources	1. Research the contribution and mitigation of area sources – land, waste, and biomass 2. Create awareness on the filing of public interest litigations (PILs) and the impacts of open burning of waste 3. SA study
Air Pollution Monitoring and Control – Stationary Sources	1. Focus on awareness and emission reporting including the use of APCD 2. SA study 3. Create awareness of the impacts of unclean fuels including the filing of PILs
Air Pollution Monitoring and Control – Mobile Sources	1. Conduct SA studies
Air Quality Planning (Development of Action Plans - Sector/Regional Plans)	1. Identifying and suggesting mitigation plans and actionable items based on policy research 2. Develop a decision support system and knowledge sharing platform 3. Action plan to empower citizens' voice on environmental policy 4. Action plan to engage citizens to protest air pollution issues in their localities

Job roles in NGOs/Think Tanks in AQM

S. No.	Sector/Sub-sector	Job Role	NSQF Level
1	AQM	Head of Govt. Department/Commissioner of ULB/CEO of Company	8
2	AQM	Programme Head/Project Head/Department Head	8
3	Air Quality Planning	Sector Expert	7
4	Policy and Regulation	Sector Expert	7
5	Air Pollution Monitoring and Control – Mobile Source	Sector Expert	7
6	Air Pollution Monitoring and Control – Area Source	Sector Expert	7
7	Air Pollution Monitoring and Control – Stationary Source	Sector Expert	7
8	Air Pollution Monitoring and Control – Stationary Source	APCD Specialist	6
9	Policy and Regulation	Specialist	6
10	Economic/Finance	Economist - AQM	6
11	Health	Health Specialist - AQM	6
12	Inventory, Modelling, and Forecasting	Data Portal Developer/Coordinators	6
13	Inventory, Modelling, and Forecasting	Specialist • Geo-spatial Modelling • Air Quality Modelling • Receptor Modelling • Economic Modelling	6
14	Air Quality Planning	Specialist	6
15	Air Pollution Monitoring and Control – Mobile Source	Specialist	6
16	Air Pollution Monitoring and Control – Stationary Source	Specialist	6
17	Air Pollution Monitoring and Control – Area Source	Specialist	6
18	AQM	Data Scientist	6
19	AQM	Communicator	6
20	AQM	Researcher/Analyst	5
21	AQM	Data Analyst	5
22	Air Pollution Monitoring and Control – Area Source	Field Supervisor	5

AQM Occupational Map of NGOs/Think Tanks



9. Consultants/Consulting Firms

There are numerous consulting firms and individual consultants who are associated with different activities of AQM in India. It is estimated that each stakeholder in this sector is working with the support of different consultants or consulting firms. Consultants are experts in planning and designing, they also support the implementation of projects for public and private clients, which include governments, industries, and research institutes.

Role of Consultants/Consulting Firms in AQM

Sub-sector	Key Roles and Responsibilities
AAQ	1. Monitor pollution and emissions 2. Select and monitor the performance of ambient APCDs (smog towers/anti-smog gun)
Policy and Regulation	1. Provide technical input to policymakers
Inventory, Modelling, and Forecasting	1. Develop, host, and feed data to web-based tool that supports policy-level implementation, planning, and tracking of pollutants. 2. Assessment of emissions
Audit, Inspection, and Enforcement	1. Auditing of industries 2. Preparation/Updating of SOPs for audit and inspection 3. Provide inputs for compliance enforcement

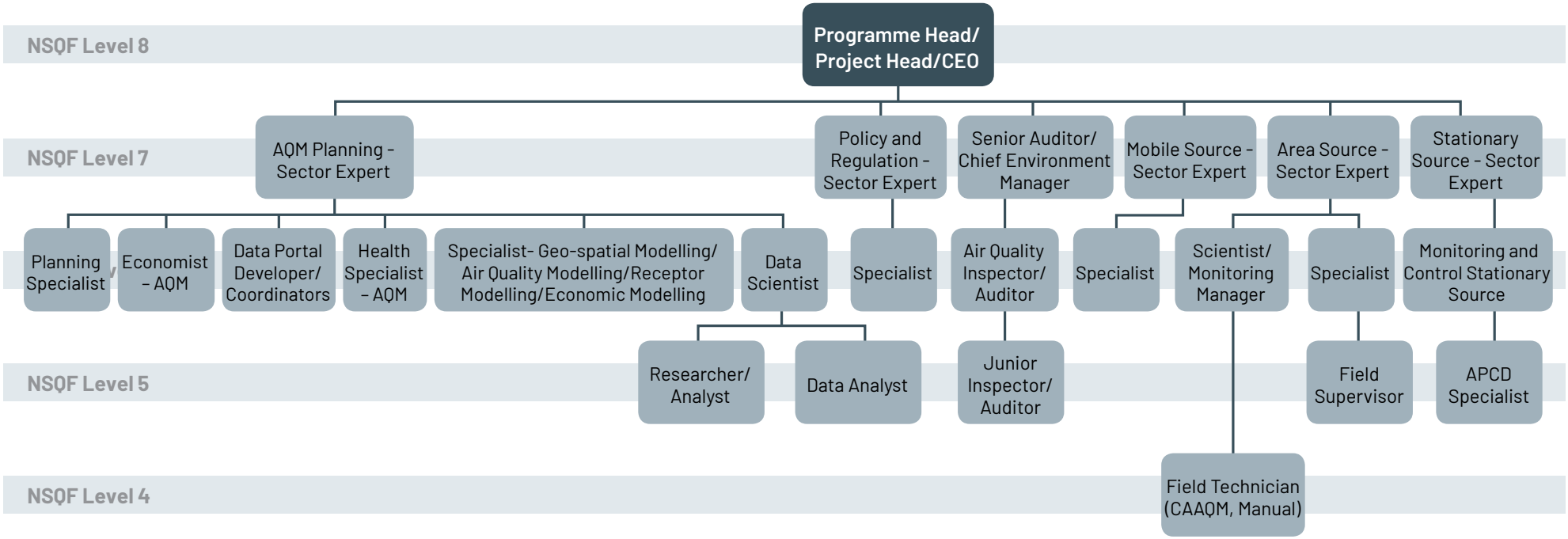
Air Pollution Monitoring and Control – Area Sources	1. Technically support implementing agencies
Air Pollution Monitoring and Control – Stationary Sources	1. Provide technical assistance to industry/stationary sources in selecting appropriate APCDs 2. Monitor performance of APCDs 3. Assist industry in emission monitoring and control 4. Provide technical services
Air Pollution Monitoring and Control – Mobile Sources	1. Technically support implementing agencies
Air Quality Planning (Development of Action Plans - Sector/Regional Plans)	1. Review of past initiatives – what has worked and what has not 2. Supplement capacity in government agencies such as SPCBs through contract/project-based engagements 3. Capacity building of all stakeholders 4. Provide technical input to planners 5. Optimize CTMs for better AQ simulation and develop expanded receptor model techniques to resolve similar sources

Job roles in Consultants/Consulting Firms in AQM

S. No.	Sector/Sub-sector	Job Role	NSQF Level
1	AQM	CEO of Company/Programme Head/Project Head/Department Head	8
2	Air Quality Planning	Sector Expert	7
3	Audit, Inspection, and Enforcement	Regional Air Quality Manager/Senior Regulator/Senior Auditor/Chief Environment Manager	7
4	Policy and Regulation	Sector Expert	7
5	Air Pollution Monitoring and Control – Mobile Source	Sector Expert	7
6	Air Pollution Monitoring and Control – Area Source	Sector Expert	7
7	Air Pollution Monitoring and Control – Stationary Source	Sector Expert	7
8	Air Pollution Monitoring and Control – Stationary Source	APCD Specialist	6
9	Policy and Regulation	Specialist	6
10	Economic/Finance	Economist - AQM	6
11	Health	Health Specialist - AQM	6
12	Inventory, Modelling, and Forecasting	Data Portal Developer/Coordinators	6
13	Inventory, Modelling, and Forecasting	Specialist • Geo-spatial Modelling • Air Quality Modelling • Receptor Modelling • Economic Modelling	6

14	Air Quality Planning	Specialist	6
15	Air Pollution Monitoring and Control – Mobile Source	Specialist	6
16	Air Pollution Monitoring and Control – Stationary Source	Specialist	6
17	Air Pollution Monitoring and Control – Area Source	Specialist	6
18	AQM	Data Scientist	6
19	Audit, Inspection, and Enforcement	Air Quality Inspector/Auditor	6
20	AAQ Monitoring	Lab Scientist/Monitoring Manager	5
21	AQM	Researcher/Analyst	5
22	AQM	Data Analyst	5
23	Audit, Inspection, and Enforcement	Junior Inspector/Auditor	5
24	Air Pollution Monitoring and Control – Area Source	Field Supervisor	5
25	AAQ Monitoring	Field Technician (CAAQM, Manual)	4

AQM Occupational Map of Consultants/Consulting firms



10. Air Polluting Industries

All industries/mines that generate emissions are termed air polluting industries. The major portions of the emissions are generated due to the combustion of biomass, coal, gas, or petroleum. These industries monitor their emissions, conduct internal audits, and are legally bound to comply with different statutory and regulatory requirements.

There are approximately 0.22 million air polluting industries. These industries are majorly classified into three categories by CPCB[19]: green, orange, and red. The red category of industries has a strict statutory obligation to continuously monitor and control their emissions while the orange category must control their emissions and conduct internal audits. The green category is relieved from these statutory requirements but few of them may implement air pollution emission control equipment.

Following is a list of air polluting industries in India:

Large Air polluting Industries	Other Air polluting Industries	Brick Kilns & Stone Crushers	Big Mines
4,700	1,01,285	1,12,000	3,886

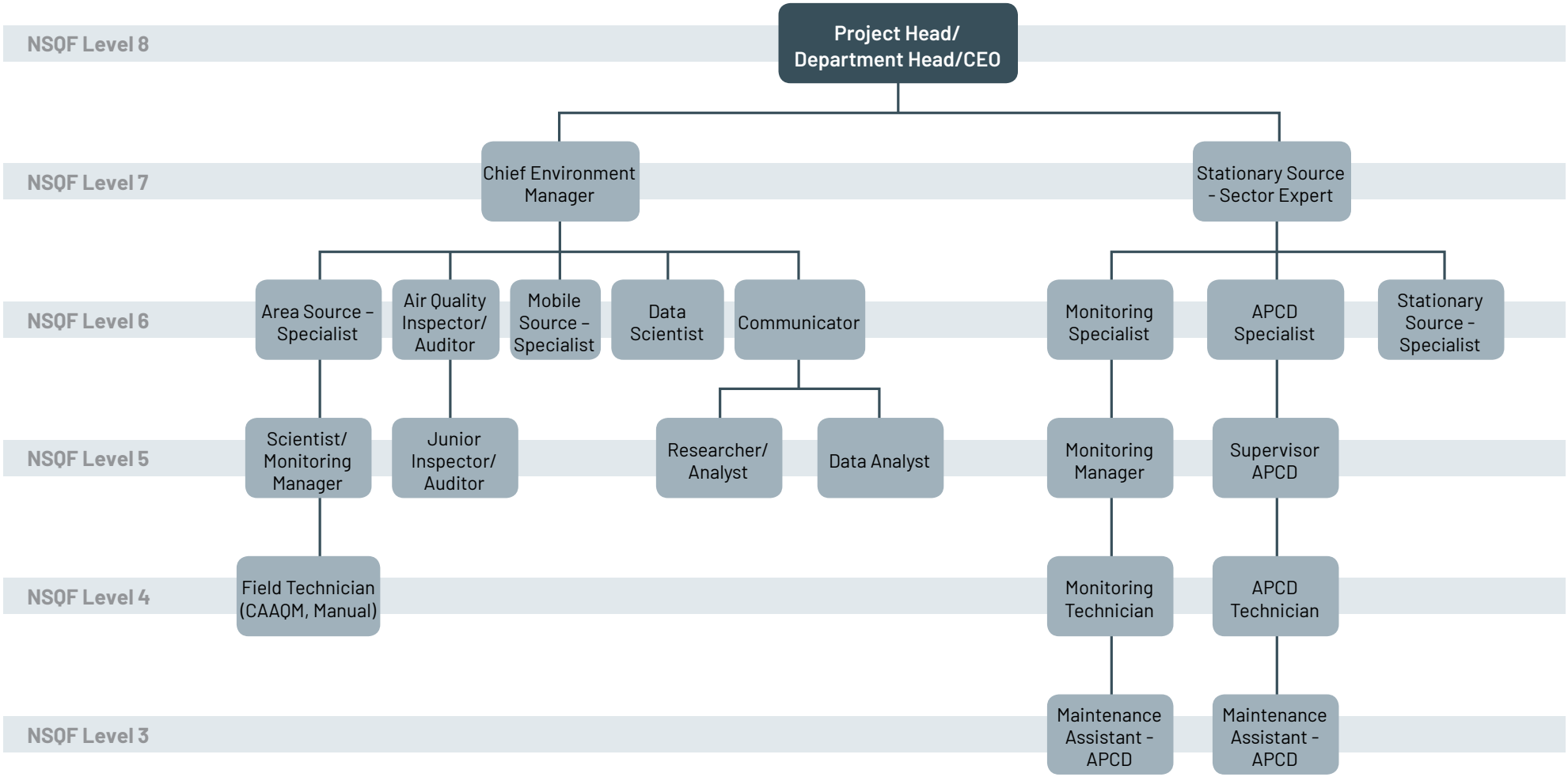
Role of Air Polluting Industries in AQM

Sub-sector	Key Roles and Responsibilities
AAQ	
Policy and Regulation	1. Implement policy and regulations 2. Provide technical input to policymakers
Inventory, Modelling, and Forecasting	
Audit, Inspection, and Enforcement	1. Internal audit for adoption of cleaner production and to control technologies 2. Internal performance audit of pollution control devices 3. Maintain records for internal/external inspection 4. Ensure compliance
Air Pollution Monitoring and Control – Area Sources	1. Control area source emissions (if any), e.g., mining, construction, and stone crusher industry
Air Pollution Monitoring and Control – Stationary Sources	1. Installation of monitoring devices and pollution control devices 2. Operation and maintenance 3. Monitor and control emissions 4. Focus on self-regulation and meet the specified limits and conditions as prescribed by relevant regulators 5. Develop infrastructure for self-assessment and control
Air Pollution Monitoring and Control – Mobile Sources	
Air Quality Planning (Development of Action Plans - Sector/Regional Plans)	1. Provide technical inputs to planners

Job roles in Air Polluting Industries in AQM

S. No.	Sector/Sub-sector	Job Role	NSQF Level
1	AQM	CEO/Programme Head/Project Head/Department Head	8
2	Audit, Inspection, and Enforcement	Regional Air Quality Manager/Senior Regulator/Senior Auditor/Chief Environment Manager	7
3	Air Pollution Monitoring and Control – Stationary Source	Sector Expert	7
4	Air Pollution Monitoring and Control – Stationary Source	Monitoring Specialist	6
5	AAQ Monitoring	Monitoring Specialist	6
6	Air Pollution Monitoring and Control – Stationary Source	APCD Specialist	6
7	Air Pollution Monitoring and Control – Mobile Source	Specialist	6
8	Air Pollution Monitoring and Control – Stationary Source	Specialist	6
9	Air Pollution Monitoring and Control – Area Source	Specialist	6
10	AQM	Data Scientist	6
11	AQM	Communicator	6
12	Audit, Inspection, and Enforcement	Air Quality Inspector/Auditor	6
13	Air Pollution Monitoring and Control – Stationary Source	Monitoring Manager	5
14	AAQ Monitoring	Lab Scientist/Monitoring Manager	5
15	Air Pollution Monitoring and Control – Stationary Source	Supervisor APCD (Including O & M)	5
16	AQM	Researcher/Analyst	5
17	AQM	Data Analyst	5
18	Audit, Inspection, and Enforcement	Junior Inspector/Auditor	5
19	Air Pollution Monitoring and Control – Stationary Source	APCD Technician (Including O & M)	4
20	Air Pollution Monitoring and Control – Stationary Source	Monitoring Technician	4
21	AAQ Monitoring	Field Technician (CAAQM, Manual)	4
22	Air Pollution Monitoring and Control – Stationary Source	Maintenance Assistant - APCD (Including O & M)	3

AQM Occupational Map of Air Polluting Industries



11. Air Pollution Monitoring and Control Industries

Air pollution monitoring and control industry includes companies working in the manufacturing, installation, operations, and management of AQM and pollution control equipment. They also conduct air pollution monitoring through advanced instrumentations or laboratories. Air pollution industry can be classified into the following two categories:

A. Air pollution equipment manufacturer

A.1 Air pollution monitoring equipment manufacturer

A.2 Air pollution control equipment manufacturer

B. Air pollution equipment service provider

B.1 Air pollution monitoring equipment service provider (installation, operation, and maintenance of monitoring devices, this includes PUC centres)

B.2 Air pollution control equipment service provider (installation, operation, and maintenance of control devices)

Following are some of the air pollution monitoring and control industries operating in India:

1. Envirotech Instruments Pvt. Ltd.	2. Chemito Technologies Pvt. Ltd.	3. LogicLadder Technologies Pvt. Ltd.	4. DK Enterprise
5. OPSIS AB (Distributor: Nevco Engineers Pvt. Ltd.)	6. Envea Cairpol	7. Perfect Pollucon Services	8. Uniphos Envirotronic Pvt. Ltd.
9. Axis Solutions Pvt. Ltd.	10. Cooper Environmental/Sailbri Cooper Inc.	11. BBM Acoustic Pvt. Ltd.	12. BBM Acoustic Pvt. Ltd.
13. Ecomak Environmental and Industrial Systems Pvt. Ltd.	14. Clear Ion Experts Pvt. Ltd.	15. Apzem India Engineering	16. Faridabad Furnace Manufacturers Pvt. Ltd.
17. Airochem Engineering Company	18. Desicant Rotor International Pvt. Ltd.	19. CK Airtech India Pvt. Ltd.	20. AlfaTherm Ltd.

Apart from the above, there are approximately 51,777 PUC centres in India that monitor pollution from mobile sources:

S. No.	Organization type	Number
1	PUC	51,777

Role of Air Pollution Monitoring and Control Industries in AQM

Sub-sector	Key Roles and Responsibilities
AAQ	1. Monitor ambient air pollution 2. Install, operate, and maintain CAAQMS 3. Select and monitor the performance of ambient air pollution monitoring devices 4. Collect samples for laboratory testing

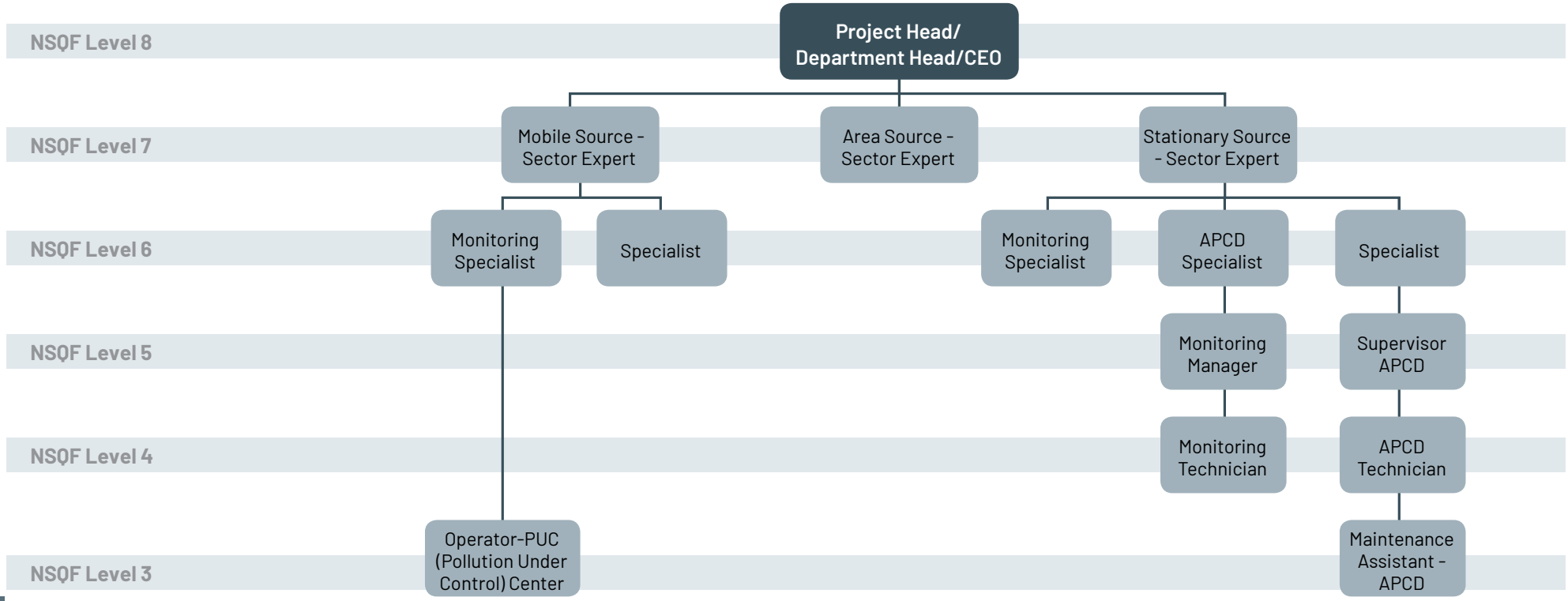
Policy and Regulation	1. Provide technical inputs to different stakeholders
Inventory, Modelling, and Forecasting	1. Collect air quality data 2. Develop inventory reports 3. Feed data to relevant portals 4. Provide insights for data analysis 5. Collaborate with IORs, SPCBs, CPCB, and ULBs for inventory modelling and forecasting
Audit, Inspection, and Enforcement	1. Technically support/assist auditors 2. QA and QC of audit reports
Air Pollution Monitoring and Control – Area Sources	1. Develop/Research technology for monitoring and control pollution from area sources 2. Pilot run new technologies 3. Install, operate, and maintain implemented technologies
Air Pollution Monitoring and Control – Stationary Sources	1. Develop/Research technologies for monitoring and control pollution from stationary sources 2. Pilot run new technologies 3. Install, operate, and maintain implemented technologies 4. Technically support the selection of right technology for industries
Air Pollution Monitoring and Control – Mobile Sources	1. Develop/Research technology for monitoring and control of pollution from mobile sources 2. Pilot run new technologies 3. Install, operate, and maintain implemented technologies
Air Quality Planning (Development of Action Plans - Sector/Regional Plans)	1. Provide technical inputs to planners 2. Capacity building for execution at the local level

Job roles in Air Pollution Monitoring and Control Industries in AQM

S. No.	Sector/Sub-sector	Job Role	NSQF Level
1	AQM	CEO of Company/Programme Head/Project Head/Department Head	8
2	Air Pollution Monitoring and Control – Mobile Source	Sector Expert	7
3	Air Pollution Monitoring and Control – Area Source	Sector Expert	7
4	Air Pollution Monitoring and Control – Stationary Source	Sector Expert	7
5	Air Pollution Monitoring and Control – Stationary Source	Monitoring Specialist	6
6	AAQ Monitoring	Monitoring Specialist	6
7	Air Pollution Monitoring and Control – Mobile Source	Monitoring Specialist	6
8	Air Pollution Monitoring and Control – Stationary Source	APCD Specialist	6
9	Air Pollution Monitoring and Control – Mobile Source	Specialist	6

10	Air Pollution Monitoring and Control – Stationary Source	Specialist	6
11	AQM	Data Scientist	6
12	Air Pollution Monitoring and Control – Stationary Source	Monitoring Manager	5
13	Air Pollution Monitoring and Control – Stationary Source	Supervisor APCD (Including O & M)	5
14	AQM	Researcher/Analyst	5
15	AQM	Data Analyst	5
16	Air Pollution Monitoring and Control – Stationary Source	APCD Technician (Including O & M)	4
17	Air Pollution Monitoring and Control – Stationary Source	Monitoring Technician	4
18	AAQ Monitoring	Field Technician (CAAQM, Manual)	4
19	Air Pollution Monitoring and Control – Stationary Source	Maintenance Assistant - APCD (Including O & M)	3
20	Air Pollution Monitoring and Control – Mobile Source	Operator-PUC Centre	3

AQM Occupational Map of Air Pollution Monitoring and Control



12. Air Quality Laboratories

The air quality laboratories conduct studies for testing and analysis of samples and calibration of monitoring equipment. Laboratories also conduct audit and impact assessment studies. There are more than 500 government and private laboratories working in the AQM sector, including 24 labs which are accredited[20] by CPCB. These labs are recognized under the environment (protection) act, 1986.

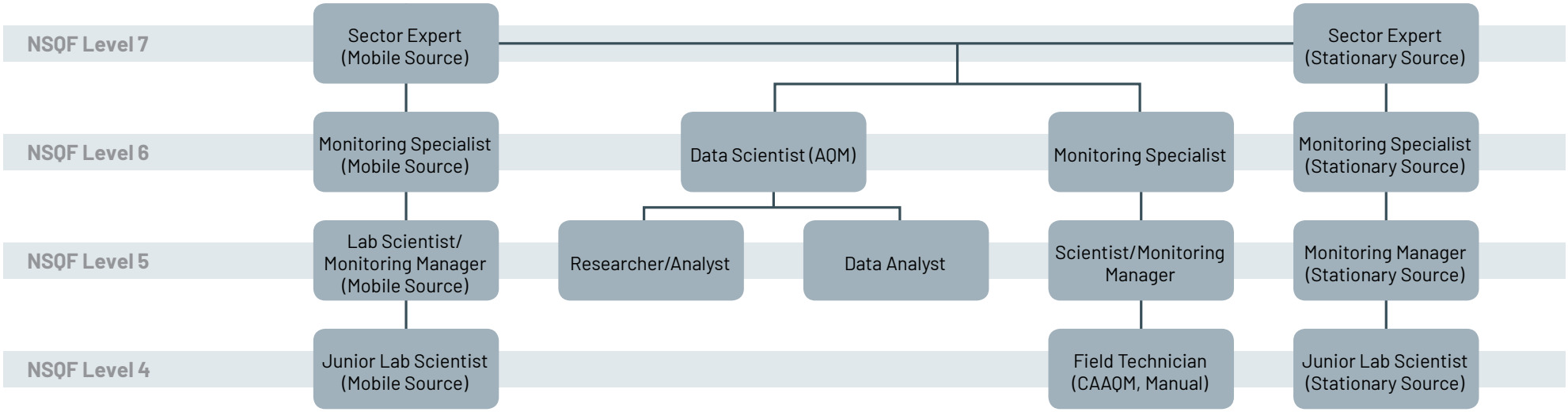
Role of Air Quality Laboratories in AQM

Sub-sector	Key Roles and Responsibilities
AAQ	1. Run AAQ monitoring stations 2. Research on AAQ monitoring techniques 3. Monitor emissions
Policy and Regulation	1. Aid CPCB/SPCBs in the development of an air pollution mitigation framework
Inventory, Modelling, and Forecasting	1. Validate data 2. Quality control and assurance of data generated 3. Analysis of data 4. Assessment of emissions 5. Assist industry in reliable assessment
Audit, Inspection, and Enforcement	1. Providing testing support including calibration of instruments 2. Conduct vehicle and fuel testing 3. QA/QC for regulatory testing 4. Focus on performance monitoring and performance appraisals
Air Pollution Monitoring and Control – Area Sources	1. Collection of samples from area sources 2. Conduct analysis 3. Prepare report 4. Calibrate the equipment required for monitoring of area sources
Air Pollution Monitoring and Control – Stationary Sources	1. Collection of samples from stationary sources 2. Conduct analysis 3. Prepare report 4. Calibrate the equipment required for monitoring of stationary sources
Air Pollution Monitoring and Control – Mobile Sources	1. Collection of samples from mobile sources 2. Conduct analysis 3. Prepare report 4. Calibrate the equipment required for monitoring of mobile sources
Air Quality Planning (Development of Action Plans - Sector/Regional Plans)	1. Provide training to calibrate monitoring instruments and how to monitor/collect quality data. 2. Developing sectoral methodologies for emission inventories

Job roles in Air Quality Laboratories in air quality management

S. No.	Sector/Sub-sector	Job Role	NSQF Level
1	Air Pollution Monitoring and Control – Mobile Source	Sector Expert	7
2	Air Pollution Monitoring and Control – Stationary Source	Sector Expert	7
3	Air Pollution Monitoring and Control – Stationary Source	Monitoring Specialist	6
4	AAQ Monitoring	Monitoring Specialist	6
5	Air Pollution Monitoring and Control – Mobile Source	Monitoring Specialist	6
6	AQM	Data Scientist	6
7	Air Pollution Monitoring and Control – Stationary Source	Monitoring Manager	5
8	AAQ Monitoring	Lab Scientist/Monitoring Manager	5
9	Air Pollution Monitoring and Control – Mobile Source	Lab Scientist/Monitoring Manager	5
10	AQM	Researcher/Analyst	5
11	AQM	Data Analyst	5
12	AAQ Monitoring	Field Technician (CAAQM, Manual)	4
13	Air Pollution Monitoring and Control – Stationary Source	Junior Lab Scientist	4
14	Air Pollution Monitoring and Control – Mobile Source	Junior Lab Scientist	4

AQM Occupational Map of Government/Private Laboratories



13. Media

All organizations that disseminate AQM related information to a large number of people fall under the media category. These organizations use television, radio, and newspapers as a means of communication.

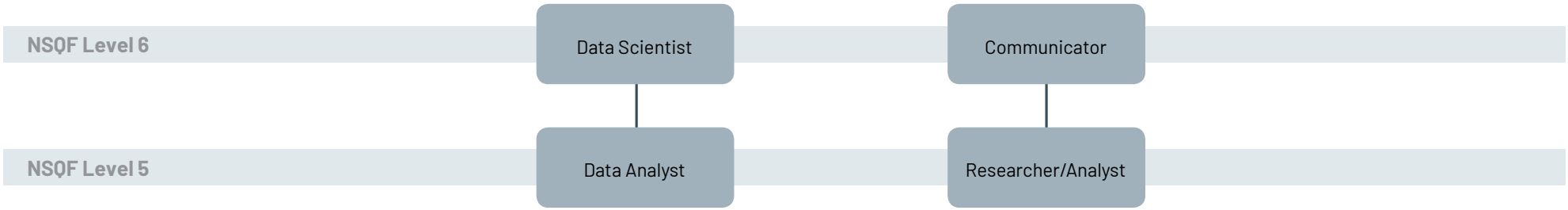
Role of Media in AQM

Sub-sector	Key Roles and Responsibilities
AAQ	1. Report AAQ
Policy and Regulation	
Inventory, Modelling, and Forecasting	1. Take inputs from SPCBs or state environment departments to inform the public about their actions 2. Outreach and cover important aspects and progress by highlighting the problem areas 3. Provide an outlet for residents and agencies to communicate their actions/complaints
Audit, Inspection, and Enforcement	
Air Pollution Monitoring and Control – Area Sources	
Air Pollution Monitoring and Control – Stationary Sources	
Air Pollution Monitoring and Control – Mobile Sources	
Air Quality Planning (Development of Action Plans - Sector/Regional Plans)	1. Provide a platform for AQM experts to deliberate on important issues

Job roles in Media in AQM

S. No.	Sector/Sub-sector	Job Role	NSQF Level
1	AQM	Data Scientist	6
2	AQM	Communicator	6
3	AQM	Researcher/Analyst	5
4	AQM	Data Analyst	5

AQM Occupational Map of Media



14. Financial Institutions/Economic Institutes

Financial institutions/Economic institutes financially support industries, governments, and research institutes by providing accessible finance in the form of loans or grants to combat air pollution.

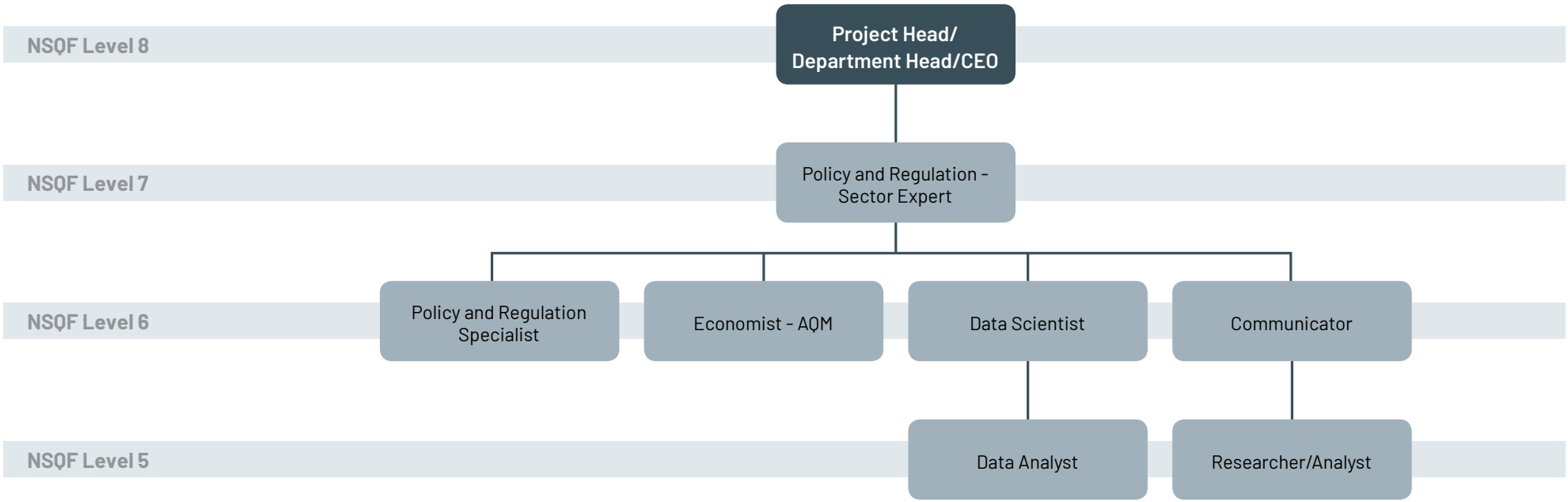
Role of Financial Institutions/Economic Institutes in AQM

Sub-sector	Key Roles and Responsibilities
AAQ	
Policy and Regulation	1. Design frameworks for evaluating performance and understanding how financial assistance can be used to drive action
Inventory, Modelling, and Forecasting	1. Review of AQM public expenditure 2. Assess financial requirements for implementation and identification of financial resources 3. Assessment of performance
Audit, Inspection, and Enforcement	1. Exercise due diligence for the right control technology
Air Pollution Monitoring and Control – Area Sources	1. Provide funding for new technologies 2. Provide funding that can dictate the course of action for pollution mitigation in an area
Air Pollution Monitoring and Control – Stationary Sources	1. Provide funding for the installation of control systems
Air Pollution Monitoring and Control – Mobile Sources	
Air Quality Planning (Development of Action Plans - Sector/Regional Plans)	1. Conduct viability studies of projects which include environmental and social benefits

Job roles in Financial Institutions/Economic Institutes in AQM

S. No.	Sector/Sub-sector	Job Role	NSQF Level
1	AQM	Head of Govt. Department/CEO of Company	8
2	Policy and Regulation	Sector Expert	7
3	Policy and Regulation	Specialist	6
4	Economic/Finance	Economist - AQM	6
5	AQM	Data Scientist	6
6	AQM	Communicator	6
7	AQM	Researcher/Analyst	5
8	AQM	Data Analyst	5

AQM Occupational Map of Financial Institutions/Economic Institutes



15. Health Agencies/Institutes

Agencies/Institutions that conduct medical research and carry out health impact assessments of air pollution (indoor/outdoor) fall under this category.

Following are some of the reputed organizations working in this category:

1. All India Institute of Medical Sciences (AIIMS)	2. Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh
3. Sri Ramachandra Medical College	4. Public Health Foundation of India (PHFI)
5. INCLEN Trust	6. University College of Medical Sciences, Delhi
7. Lung Care Foundation	

Role of Health Agencies/Institutes in AQM

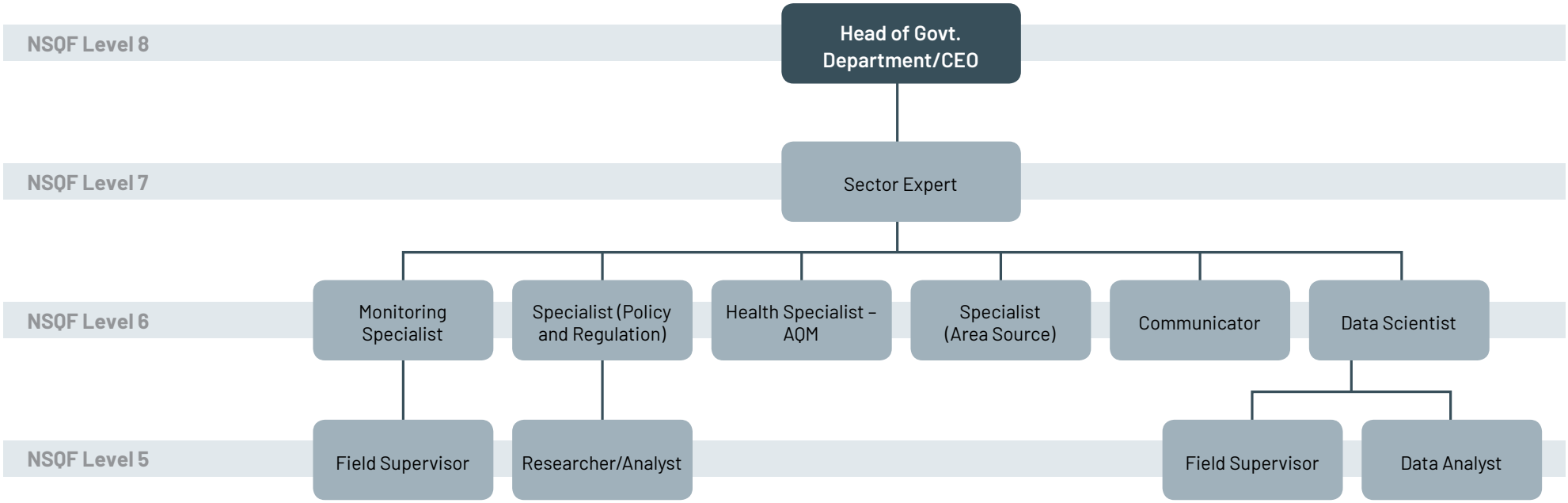
Sub-sector	Key Roles and Responsibilities
AAQ	
Policy and Regulation	1. Provide the health basis for air quality regulation through the generation and interpretation of new knowledge (e.g., in framing of AQ standards) 2. Integrate health information in key policy communications (e.g., Graded Response Action Plan (GRAP), health warnings) 3. Provide risk assessment/burden of disease under policy or regulatory scenarios
Inventory, Modelling, and Forecasting	1. Analyzing the impact on health, based on the results of air quality modelling 2. Conduct health impact assessments of key policies (existing or new) at national/local levels 3. Establish baseline health risk assessment (baseline morbidity/mortality and risk assessment/burden of disease based on exposure assessment developed by others) 4. Assessment of industrial emissions and their impact on health
Audit, Inspection, and Enforcement	1. Regular health audits as per occupational health standards
Air Pollution Monitoring and Control – Area Sources	1. Assess exposures and provide medical evidence regarding damage caused by area sources
Air Pollution Monitoring and Control – Stationary Sources	
Air Pollution Monitoring and Control – Mobile Sources	
Air Quality Planning (Development of Action Plans - Sector/Regional Plans)	1. Integrate health impacts with AQ planning 2. Identify specific pollutants causing health concerns and plan reduction

Job roles in Health Agencies/Institutes in AQM

S. No.	Sector/Sub-sector	Job Role	NSQF Level
1	AQM	Head of Govt. Department/CEO of Company	8
2	Policy and Regulation	Sector Expert	7
3	AAQ Monitoring	Monitoring Specialist	6
4	Policy and Regulation	Specialist	6
5	Health	Health Specialist - AQM	6

6	Air Pollution Monitoring and Control – Area Source	Specialist	6
7	AQM	Data Scientist	6
8	AQM	Communicator	6
9	AQM	Researcher/Analyst	5
10	AQM	Data Analyst	5
11	Air Pollution Monitoring and Control – Area Source	Field Supervisor	5

AQM Occupational Map of Health Agencies/Institutes



Annexure 3: Job Factors for Estimating Number of Jobs

Sl. No	Sector/Sub-sector	Job Role	NSQF Level	Ministry of Environment, Forest & Climate Change	Other Related Ministries*	Department of Environment in states/UTs	Other related Departments*	Central Pollution Control Board	CPCB Regional Office	State Pollution Control Boards/Committees	SPCBs District Office	Municipal Corporation	Municipal Council	Nagar Panchyat	Big Institute of Repute (IoR)	Other Institute of Repute (IoR)	Other academic and Research Institutes	NGOs/Think-Tanks	Consultants/Consulting firms	Large Air polluting Industries	Other Air polluting Industries	Brick Kilns & Stone Crushers	Big Mines	Air pollution Monitoring and Control	Air pollution Monitoring and Control (PUC)	Government/Private Laboratories	Media	Financial Institution/ Economic Institutes	Health Agencies/Institutes	Total Number of Jobs to meet NCAP/NMCA goals	Type of job
				Number of organizations																											
				1	8	36	288	1	10	35	200	206	1,683	2,411	20	62	150	100	500	4,700	1,01,285	1,12,000	3,886	200	51,777	524	100	25	25		
1	1. Air Quality Management	Head of Govt. Department/ Commissioner of ULB/CEO of Company	8	1	1	1	0.5					1	1							1	0.02		1					1	1	12,740	Indirect
2	1. Air Quality Management	Programme Head/ Project Head/ Department Head	8	1	1	1	0.5	1	1	1					1	1	1	1	1	1	0.01		1	1						10,866	Direct
3	2. Air Quality Planning	Sector Expert	7	2	1	1		5		3					1	0.5	0.5	0.25	0.25											432	Direct
4	7. Audit , Inspection and Enforcement	Regional Air Quality Manager/ Senior Regulator/ Senior Auditor/ Chief Environment Manager	7	1		1		5	1	3									0.5	0.25	0.01	0.01	0.25							4,014.35	Direct
5	3. Policy and Regulation	Sector Expert	7	3	8	2	1	2		1					1	0.5		0.5	0.5									1	1	865	Direct
6	10. Air Pollution Monitoring and Control - Mobile Source	Sector Expert	7	1	0.25	1		1		1		1			1	0.25	0.5	0.25	1					0.1						1,357.25	Direct
7	9. Air Pollution Monitoring and Control - Area Source	Sector Expert	7	2	0.25	1	0.25	2		2					1	0.5	0.5	0.5	0.5				1							4,496	Direct

Sl. No	Sector/Sub-sector	Job Role	NSQF Level	Ministry of Environment, Forest & Climate Change	Other Related Ministries*	Department of Environment in states/UTs	Other related Departments*	Central Pollution Control Board	CPCB Regional Office	State Pollution Control Boards/Committees	SPCBs District Office	Municipal Corporation	Municipal Council	Nagar Panchyat	Big Institute of Repute (IoR)	Other Institute of Repute (IoR)	Other academic and Research Institutes	NGOs/Think-Tanks	Consultants/Consulting firms	Large Air polluting Industries	Other Air polluting Industries	Brick Kilns & Stone Crushers	Big Mines	Air pollution Monitoring and Control	Air pollution Monitoring and Control (PUC)	Government/Private Laboratories	Media	Financial Institution/ Economic Institutes	Health Agencies/Institutes	Total Number of Jobs to meet NCAP/NMCA goals	Type of job
8	11. Air Pollution Monitoring and Control - Stationary Source	Sector Expert	7	1	0.4	1	0.4	5		2					1	0.5	0.5	0.5	0.5					1						849	Direct
9	11. Air Pollution Monitoring and Control - Stationary Source	Monitoring specialist	6					5	1	3					0.5	0.25	0.25			0.25				0.5		0.5				1,720	Direct
10	8. Ambient Air Quality Monitoring	Monitoring specialist	6	1		1		2	1	2					1	0.25	0.25	0.1		0.25				0.5		0.5			1	1,764	Direct
11	10. Air Pollution Monitoring and Control - Mobile Source	Monitoring specialist	6					1		1																0.04				56	Direct
12	11. Air Pollution Monitoring and Control - Stationary Source	APCD Specialist	6					5		2					1		0.5		0.25					1						495	Direct
13	3. Policy and Regulation	Specialist	6	6	16	4	1	4		2					2	1	0.5	1	1	0.25								1	1	2,642	Direct
14	6. Economic/ Finance	Economist - AQM	6	2		1		1		1					2	1		0.25	1									2		751	Direct
15	5. Health	Health Specialist - AQM	6	5		1		1		1					1		0.5	0.5	0.1										2	322	Direct
16	4. Inventory, Modelling and Forecasting	Data Portal Developer/ Coordinators	6					2		1					2	1	1	0.25	0.1									1	1	414	Direct
17	4. Inventory, Modelling and Forecasting	"Specialist - Geo spatial modelling - Air Quality modelling - Receptor modelling - Economic modelling"	6					5		2					5	2	2	0.5	1									2	2	1,249	Direct

Sl. No	Sector/Sub-sector	Job Role	NSQF Level	Ministry of Environment, Forest & Climate Change	Other Related Ministries*	Department of Environment in states/UTs	Other related Departments*	Central Pollution Control Board	CPCB Regional Office	State Pollution Control Boards/Committees	SPCBs District Office	Municipal Corporation	Municipal Council	Nagar Panchyat	Big Institute of Repute (IoR)	Other Institute of Repute (IoR)	Other academic and Research Institutes	NGOs/Think-Tanks	Consultants/Consulting firms	Large Air polluting Industries	Other Air polluting Industries	Brick Kilns & Stone Crushers	Big Mines	Air pollution Monitoring and Control	Air pollution Monitoring and Control (PUC)	Government/Private Laboratories	Media	Financial Institution/ Economic Institutes	Health Agencies/Institutes	Total Number of Jobs to meet NCAP/NMCA goals	Type of job
18	2. Air Quality Planning	Specialist	6	4	2	2	1	10		6		1	0.1		2	1	1	0.5	0.5											1,526.3	Direct
19	10. Air Pollution Monitoring and Control - Mobile Source	Specialist	6	5	1.25	1	0.25	5		2		2	0.25	0.1	2	1	0.5	1	2					0.2	0.01					2,847.74	Direct
20	11. Air Pollution Monitoring and Control - Stationary Source	Specialist	6	2	0.75	2	0.75	10	1	5	0.25				2	1	1	1	1	0.5	0.05	0.01		2						9,431	Direct
21	9. Air Pollution Monitoring and Control - Area Source	Specialist	6	5	0.5	1	0.5	5	1	5		1	0.25	0.1	1	1	1	1	1				2						1	9,875.85	Direct
22	1. Air Quality Management	Data Scientist	6	5	2	2		5	1	2		1			2	1	1	1	2	0.25			0.25					1	1	3,933	Direct
23	2. Air Quality Planning	Air Quality Manager - Urban	6									1	1	0.25																2,491.75	Direct
24	1. Air Quality Management	Communicator	6	2	1	1	0.5	1		1								1		0.25			0.25				1	0.5	0.5	2,598	Indirect
25	7. Audit, Inspection and Enforcement	Air Quality Inspector/Auditor	6					10	2	5	0.25								1	0.5	0.02	0.01	0.5							8,193.7	Direct
26	11. Air Pollution Monitoring and Control - Stationary Source	Monitoring Manager	5					5	2	5	1									0.5	0.01			1		1				4,487	Direct
27	8. Ambient Air Quality Monitoring	Lab Scientist/ Monitoring Manager	5					5	2	5	0.25	1	0.25		1	1	1			1				1		1			1	6,557.75	Direct
28	10. Air Pollution Monitoring and Control - Mobile Source	Lab Scientist/ Monitoring Manager	5																							0.2				100	Direct

Sl. No	Sector/Sub-sector	Job Role	NSQF Level	Ministry of Environment, Forest & Climate Change	Other Related Ministries*	Department of Environment in states/UTs	Other related Departments*	Central Pollution Control Board	CPCB Regional Office	State Pollution Control Boards/Committees	SPCBs District Office	Municipal Corporation	Municipal Council	Nagar Panchyat	Big Institute of Repute (IoR)	Other Institute of Repute (IoR)	Other academic and Research Institutes	NGOs/Think-Tanks	Consultants/Consulting firms	Large Air polluting Industries	Other Air polluting Industries	Brick Kilns & Stone Crushers	Big Mines	Air pollution Monitoring and Control	Air pollution Monitoring and Control (PUC)	Government/Private Laboratories	Media	Financial Institution/ Economic Institutes	Health Agencies/Institutes	Total Number of Jobs to meet NCAP/NMCA goals	Type of job
29	11. Air Pollution Monitoring and Control - Stationary Source	Supervisor APCD (including O & M)	5																	1	0.25									30,021	Direct
30	1. Air Quality Management	Researcher/ Analyst	5	10	2	5	1	10	2	5	1	2	1		5	2	2	1	5	1			1	1		1	0.5	2	2	15,578	Direct
31	1. Air Quality Management	Data Analyst	5	10	2	5	1	10	2	5	1	2			5	2	2	1	5	1			1	1		1	0.5	2	2	13,895	Direct
32	7. Audit, Inspection and Enforcement	Junior Inspector/ Auditor	5					20	5	10	1	5	1						2	1	0.04	0.02	1							19,210.4	Direct
33	9. Air Pollution Monitoring and Control - Area Source	Ward Supervisor	5									25	10	5																34,035	Indirect
34	9. Air Pollution Monitoring and Control - Area Source	Field Supervisor	5												5	2	2	2	5										2	3,274	Indirect
35	11. Air Pollution Monitoring and Control - Stationary Source	APCD Technician (including O & M)	4																	2	0.5	0.05								65,643	Direct
36	11. Air Pollution Monitoring and Control - Stationary Source	Monitoring Technician	4					10	5	10	2									1	0.05			2		3				12,546	Direct
37	8. Ambient Air Quality Monitoring	Field Technician (CAAQM, Manual)	4					10	5	10	0.5	2	0.5		5	2	2			2				2		2			2	13,185.5	Direct
38	11. Air Pollution Monitoring and Control - Stationary Source	Junior Lab Scientist	4					5	2	3	1									1	0.05					3				11,666	Direct

Sl. No	Sector/Sub-sector	Job Role	NSQF Level	Ministry of Environment, Forest & Climate Change	Other Related Ministries*	Department of Environment in states/UTs	Other related Departments*	Central Pollution Control Board	CPCB Regional Office	State Pollution Control Boards/Committees	SPCBs District Office	Municipal Corporation	Municipal Council	Nagar Panchyat	Big Institute of Repute (IoR)	Other Institute of Repute (IoR)	Other academic and Research Institutes	NGOs/Think-Tanks	Consultants/Consulting firms	Large Air polluting Industries	Other Air polluting Industries	Brick Kilns & Stone Crushers	Big Mines	Air pollution Monitoring and Control	Air pollution Monitoring and Control (PUC)	Government/Private Laboratories	Media	Financial Institution/ Economic Institutes	Health Agencies/Institutes	Total Number of Jobs to meet NCAP/NMCA goals	Type of job
39	10. Air Pollution Monitoring and Control - Mobile Source	Junior Lab Scientist	4																							0.5				250	Direct
40	11. Air Pollution Monitoring and Control - Stationary Source	Maintenance Assistant - APCD (including O & M)	3																	5	1	0.25		10						1,54,785	Direct
41	10. Air Pollution Monitoring and Control - Mobile Source	Operator-PUC (Pollution under control) Centre	3																						1					51,777	Direct
42	9. Air Pollution Monitoring and Control - Area Source	Municipal Worker	2									15,00,000																		15,00,000	Indirect
Total				**69**	**315**	**1,260**	**2,484**	**168**	**340**	**3,745**	**1,650**	**9,270**	**25,834.05**	**131,39.95**	**1,010**	**1,410.5**	**3,225**	**1,510**	**16,100**	**98,700**	**2,03,582.85**	**37,632**	**35,945.5**	**4,860**	**52,036**	**7,182**	**200**	**337.5**	**512.5**	**20,22,939**	

Note: *Other key ministries and departments are Power, Transport, MSME, Industry, Urban, Agriculture, and Rural Development

Annexure 4: Priority Level and Number of Trainees to be Trained at Different Job Roles under the National Programme

Very High Priority

Sector/Sub-sector	Job Role	NSQF Level	Number of Jobs	Priority	Trainees to be Trained in the Next 5 Years	Type of Training
Area Source	Municipal Worker	2	15,00,000	Very High	7,50,000	RPL
Mobile Source	Operator – PUC (Pollution under control) Centre	3	51,777	Very High	25,000	RPL/NSQF Aligned Courses
Stationary Source	Maintenance Assistant – APCD (including O & M)	3	1,54,785	Very High	75,000	RPL/NSQF Aligned Courses
Ambient Air Quality (AAQ) Monitoring	Field Technician (CAAQM, Manual)	4	13,186	Very High	7,500	NSQF Aligned Courses
Stationary Source	APCD Technician (including O & M)	4	65,643	Very High	25,000	RPL/NSQF Aligned Courses
Stationary Source	Monitoring Technician	4	12,546	Very High	5,000	NSQF Aligned Courses
Air Quality Management – General	Researcher/Analyst	5	15,578	Very High	7,500	Short-term NSQF Aligned Training Programme
Air Quality Management – General	Data Analyst	5	13,895	Very High	7,500	Short-term NSQF Aligned Training Programme
Audit, Inspection, and Enforcement	Junior Inspector/Auditor	5	19,210	Very High	7,500	Short-term NSQF Aligned Training Programme
Area Source	Ward Supervisor	5	34,035	Very High	15,000	Short-term NSQF Aligned Training Programme
Air Quality Management – General	Communicator	6	2,598	Very High	1,000	Short-term Tailored Training Programme

Sector/Sub-sector	Job Role	NSQF Level	Number of Jobs	Priority	Trainees to be Trained in the Next 5 Years	Type of Training
Air Quality Planning	Air Quality Manager – Urban	6	2,492	Very High	1,500	Short-term NSQF Aligned Training Programme
Inventory, Modelling, and Forecasting	Specialist	6	1,249	Very High	750	Short-term Tailored Training Programme
Health	Health Specialist – AQM	6	322	Very High	250	Short-term Tailored Training Programme
Economic/Finance	Economist – AQM	6	751	Very High	500	Short-term Tailored Training Programme
Air Quality Management – General	Head of Govt. Department/ Commissioner of ULB/CEO of Company	8	12,740	Very High	5,000	Bridge Course
Total			**19,00,806**		**9,34,000**	

High Priority

Area Source	Field Supervisor	5	3,274	High	1,000	Short-term NSQF Aligned Training Programme
Air Quality Planning	Specialist	6	1,526	High	500	Short-term Tailored Training Programme
Policy and Regulation	Specialist	6	2,642	High	500	Short-term Tailored Training Programme
Inventory, Modelling, and Forecasting	Data Portal Developer/ Coordinators	6	414	High	100	Short-term Tailored Training Programme
Audit, Inspection, and Enforcement	Air Quality Inspector/Auditor	6	8,194	High	2,000	Short-term Tailored Training Programme
Air Pollution Monitoring and Control – Mobile Source	Specialist	6	2,848	High	750	Short-term Tailored Training Programme
Audit, Inspection, and Enforcement	Regional Air Quality Manager/ Senior Regulator/Senior Auditor/Chief Environment Manager	7	4,014	High	1,000	Advanced Course
Total			**22,912**		**5,850**	

Sector/Sub-sector	Job Role	NSQF Level	Number of Jobs	Priority	Trainees to be Trained in the Next 5 Years	Type of Training
Medium Priority						
Stationary Source	Junior Lab Scientist	4	11,666	Moderate	1,000	NSQF Aligned Courses
AAQ Monitoring	Lab Scientist/Monitoring Manager	5	6,558	Moderate	500	Short-term NSQF Aligned Training Programme
AQM – GeneralShort-term Tailored Training Programme	Data Scientist	6	3,933	Moderate	300	Short-term Tailored Training Programme
AAQ Monitoring	Monitoring Specialist	6	1,764	Moderate	150	Short-term Tailored Training Programme
Area Source	Specialist	6	9,876	Moderate	100	Short-term Tailored Training Programme
Stationary Source	Specialist	6	9,431	Moderate	1,000	Short-term Tailored Training Programme
Air Quality Planning	Sector Expert	7	432	Moderate	50	Advanced Course
Policy and Regulation	Sector Expert	7	865	Moderate	100	Advanced Course
Air Quality Management	Programme Head/Project Head/Department Head	8	10,866	Moderate	1,000	Advanced Course
Total			**55,390**		**4,200**	
Low Priority						
Mobile Source	Junior Lab Scientist*	4	250	Low	0	NSQF Level Aligned Course
Mobile Source	Lab Scientist/Monitoring Manager*	5	100	Low	0	Short-term NSQF Aligned Training Programme
Stationary Source	Monitoring Manager	5	4,487	Low	250	Short-term NSQF Aligned Training Programme
Stationary Source	Supervisor APCD (Including O & M)	5	30,021	Low	1,500	Short-term NSQF Aligned Training Programme

Sector/Sub-sector	Job Role	NSQF Level	Number of Jobs	Priority	Trainees to be Trained in the Next 5 Years	Type of Training
Mobile Source	Monitoring Specialist*	6	56	Low	0	Short-term Tailored Training Programme
Stationary Source	Monitoring Specialist	6	1,720	Low	100	Short-term Tailored Training Programme
Stationary Source	APCD Specialist	6	495	Low	25	Short-term Tailored Training Programme
Area Source	Sector Expert	7	4,496	Low	200	Advanced Course
Mobile Source	Sector Expert	7	1,357	Low	50	Advanced Course
Stationary Source	Sector Expert	7	849	Low	50	Advanced Course
Total			**43,831**		**2,175**	
Total Across All Priority Levels			**20,22,939**		**9,46,225**	

* These jobs are in automobile testing labs. They are highly specialized and are to be done by the industry.

Annexure 5: Year-wise Number of Trainees to be Trained at Different NSQF Levels Under the Proposed National Programme

Year-wise number of trainees to be trained at different national skills qualifications framework levels under the National Programme

Sector/Sub-sector	Job Role	NSQF Level	Number of Trainees					
			Year 1	Year 2	Year 3	Year 4	Year 5	Total
Area Source	Municipal Worker	2	2,50,000	2,50,000	2,50,000	0	0	7,50,000
Total Level 2			2,50,000	2,50,000	2,50,000	0	0	7,50,000
Mobile Source	Operator – PUC Centre	3	10,000	10,000	5,000	0	0	25,000
Stationary Source	Maintenance Assistant – APCD (Including O & M)	3	15,000	15,000	15,000	15,000	15,000	75,000
Total Level 3			25,000	25,000	20,000	15,000	15,000	1,00,000
Ambient Air Quality Monitoring	Field Technician (CAAQM, Manual)	4	3,750	3,750	0	0	0	7,500
Stationary Source	APCD Technician (Including O & M)	4	5,000	5,000	5,000	5,000	5,000	25,000
Stationary Source	Monitoring Technician	4	2,500	2,500	0	0	0	5,000
Stationary Source	Junior Lab Scientist	4	200	200	200	200	200	1,000
Mobile Source	Junior Lab Scientist	4	0	0	0	0	0	0
Total Level 4			11,450	11,450	5,200	5,200	5,200	38,500
Ambient Air Quality Monitoring	Lab Scientist/Monitoring Manager	5	100	100	100	100	100	500
Air Quality Management – General	Researcher/Analyst	5	1,500	1,500	1,500	1,500	1,500	7,500
Air Quality Management – General	Data Analyst	5	1,500	1,500	1,500	1,500	1,500	7,500
Audit, Inspection, and Enforcement	Junior Inspector/Auditor	5	1,500	1,500	1,500	1,500	1,500	7,500
Area Source	Ward Supervisor	5	5,000	5,000	5,000	0	0	15,000
Area Source	Field Supervisor	5	200	200	200	200	200	1,000
Mobile Source	Lab Scientist/Monitoring Manager	5	0	0	0	0	0	0

Sector/Sub-sector	Job Role	NSQF Level	Number of Trainees					
			Year 1	Year 2	Year 3	Year 4	Year 5	Total
Stationary Source	Monitoring Manager	5	0	0	50	100	100	250
Stationary Source	Supervisor APCD (Including O & M)	5	0	250	250	1,000	1,000	1,500
Total Level 5			9,800	10,050	10,100	5,900	5,900	40,750
Air Quality Management – General	Communicator	6	200	200	200	200	200	1,000
Air Quality Planning	Air Quality Manager – Urban	6	250	500	750	0	0	1,500
Inventory, Modelling, and Forecasting	Specialist	6	250	500	750	0	0	1,500
Health	Health Specialist – AQM	6	50	100	100	0	0	250
Economic/Finance	Economist – AQM	6	100	200	200	0	0	500
Air Quality Management – General	Data Scientist	6	100	100	100	0	0	300
Ambient Air Quality Monitoring	Monitoring Specialist	6	50	50	50	0	0	150
Area Source	Specialist	6	333	333	333	0	0	100
Stationary Source	Specialist	6	200	200	200	200	200	1,000
Air Quality Planning	Specialist	6	167	167	167	0	0	500
Policy and Regulation	Specialist	6	100	100	100	100	100	500
Inventory, Modelling, and Forecasting	Data Portal Developer/Coordinators	6	50	50	0	0	0	100
Audit, Inspection, and Enforcement	Air Quality Inspector/Auditor	6	400	400	400	400	400	2,000
Air Pollution Monitoring and Control – Mobile Source	Specialist	6	250	250	250	0	0	750
Mobile Source	Monitoring Specialist	6	0	0	0	0	0	0
Stationary Source	Monitoring Specialist	6	0	25	25	25	25	100
Stationary Source	APCD Specialist	6	0	25	0	0	0	25
Total Level 6			2,500	3,200	3,625	925	925	10,275
Audit, Inspection, and Enforcement	Regional Air Quality Manager/Senior Regulator/Senior Auditor/Chief Environment Manager	7	200	200	200	200	200	1,000

Sector/Sub-sector	Job Role	NSQF Level	Number of Trainees					
			Year 1	Year 2	Year 3	Year 4	Year 5	Total
Air Quality Planning	Sector Expert	7	50	0	0	0	0	50
Policy and Regulation	Sector Expert	7	50	50	0	0	0	100
Area Source	Sector Expert	7	0	50	50	50	50	200
Mobile Source	Sector Expert	7	25	25	0	0	0	50
Stationary Source	Sector Expert	7	25	25	0	0	0	50
Total Level 7			350	350	250	250	250	1,450
Air Quality Management – General	Head of Govt. Department/Commissioner of ULB/CEO of Company	8	1,000	2,000	2,000	0	0	5,000
Air Quality Management	Programme Head/Project Head/ Department Head	8	200	200	200	200	200	1,000
Total Level 8			1,200	2,200	2,200	200	200	6,000
Total across all NSQF levels			**3,00,300**	**3,02,250**	**2,91,375**	**27,475**	**27,475**	**9,46,225**

Annexure 6: Training Cost, Certification Body, and Funders

Sector/Sub-sector	Job Role	NSQF Level	Training Priority	Trainees to be Trained in the Next 5 Years	Type of Training	Certification Body	Possible Funders	Total training cost (in ₹ Crores)
Area Source	Municipal Worker	2	Very High	7,50,000	RPL	SCGJ	National Skill Development Corporation, Ministry of Urban Development, National Safai Karamcharis Finance & Development Corporation (Ministry of Social Justice & Empowerment), NCAP	414
Mobile Source	Operator-PUC (Pollution Under Control) Centre	3	Very High	25,000	RPL/NSQF Aligned Courses	SCGJ/Automobile Sector Skill Council	National Skill Development Corporation, NCAP, Ministry of Road, Highways & Transport	34
Stationary Source	Maintenance Assistant – APCD (Including O & M)	3	Very High	75,000	RPL/NSQF Aligned Courses	SCGJ/Power Sector Skill Council/Indian Iron and Steel Sector Skill Council		115
Ambient Air Quality Monitoring	Field Technician (CAAQM, Manual)	4	Very High	7,500	NSQF Aligned Courses	SCGJ	NCAP	39
Stationary Source	APCD Technician (Including O & M)	4	Very High	25,000	RPL/NSQF Aligned Courses	SCGJ	NCAP	38
Stationary Source	Monitoring Technician	4	Very High	5,000	NSQF Aligned Courses	SCGJ	NCAP	26
Air Quality Management – General	Researcher/Analyst	5	Very High	7,500	Short-term NSQF Aligned Training Programme	SCGJ	NCAP, multilateral/bilateral agencies, self-funded, company-funded	46

Sector/Sub-sector	Job Role	NSQF Level	Training Priority	Trainees to be Trained in the Next 5 Years	Type of Training	Certification Body	Possible Funders	Total training cost (in ₹ Crores)
Air Quality Management – General	Data Analyst	5	Very High	7,500	Short-term NSQF Aligned Training Programme	SCGJ	NCAP, multilateral/bilateral agencies, self-funded, company-funded	46
Audit, Inspection, and Enforcement	Junior Inspector/ Auditor	5	Very High	7,500	Short-term NSQF Aligned Training Programme	SCGJ	NCAP, CPCB/SPCBs, multilateral/bilateral agencies, self-funded, company-funded	46
Area Source	Ward Supervisor	5	Very High	15,000	Short-term NSQF Aligned Training Programme	SCGJ	National Skill Development Corporation, Ministry of Urban Development, NCAP, Multilateral/Bilateral agencies	83
Air Quality Management – General	Communicator	6	Very High	1,000	Short- term Tailored Training Programme	SCGJ	NCAP, Multilateral/Bilateral agencies, self-funded, company-funded	3
Air Quality Planning	Air Quality Manager – Urban	6	Very High	1,500	Short-term NSQF Aligned Training Programme	SCGJ	NCAP, Multilateral/Bilateral agencies, municipality-funded	9
Inventory, Modelling, and Forecasting	Specialist	6	Very High	750	Short-term Tailored Training Programme	SCGJ/IT-ITeS Sector Skill Council	NCAP, Multilateral/Bilateral agencies, self-funded, company-funded	2
Health	Health Specialist – AQM	6	Very High	250	Short-term Tailored Training Programme	SCGJ	NCAP, Multilateral/Bilateral agencies, self-funded, company-funded	1
Economic/Finance	Economist – AQM	6	Very High	500	Short-term Tailored Training Programme	SCGJ	NCAP, Multilateral/Bilateral agencies, self-funded, company-funded	1
Air Quality Management – General	Head of Govt. Department/ Commissioner of ULB/ CEO of Company	8	Very High	5,000	Bridge Course	SCGJ	NCAP, Multilateral/Bilateral agencies, self-funded, company-funded	8

Sector/Sub-sector	Job Role	NSQF Level	Training Priority	Trainees to be Trained in the Next 5 Years	Type of Training	Certification Body	Possible Funders	Total training cost (in ₹ Crores)
Area Source	Field Supervisor	5	High	1,000	Short-term NSQF Aligned Training Programme	SCGJ	NCAP, multilateral/bilateral agencies, self-funded, company-funded	6
Air Quality Planning	Specialist	6	High	500	Short-term Tailored Training Programme	SCGJ	NCAP, multilateral/bilateral agencies, self-funded, company-funded	1
Policy and Regulation	Specialist	6	High	500	Short-term Tailored Training Programme	SCGJ	NCAP, multilateral/bilateral agencies, self-funded, company-funded	2
Inventory, Modelling, and Forecasting	Data Portal Developer/ Coordinators	6	High	100	Short-term Tailored Training Programme	SCGJ/IT-ITeS Sector Skill Council	NCAP, multilateral/bilateral agencies, self-funded, company-funded	0
Audit, Inspection, and Enforcement	Air Quality Inspector/ Auditor	6	High	2,000	Short-term Tailored Training Programme	SCGJ	NCAP, CPCB/SPCBs, multilateral/bilateral agencies, self-funded, company-funded	6
Air Pollution Monitoring and Control – Mobile Source	Specialist	6	High	750	Short-term Tailored Training Programme	SCGJ/Automobile Sector Skill Council	NCAP, multilateral/bilateral agencies, self-funded, company-funded	2
Audit, Inspection, and Enforcement	Regional Air Quality Manager/Senior Regulator/Senior Auditor/Chief Environment Manager	7	High	1,000	Advanced Course	SCGJ	NCAP, CPCB/SPCBs, multilateral/bilateral agencies, self-funded, company-funded	2
Stationary Source	Junior Lab Scientist	4	Moderate	1,000	NSQF Aligned Courses	SCGJ	NCAP, CPCB/SPCBs, multilateral/bilateral agencies, self-funded, company-funded	6
Ambient Air Quality Monitoring	Lab Scientist/ Monitoring Manager	5	Moderate	500	Short-term NSQF Aligned Training Programme	SCGJ	NCAP, CPCB/SPCBs, multilateral/bilateral agencies, self-funded, company-funded	3

Sector/Sub-sector	Job Role	NSQF Level	Training Priority	Trainees to be Trained in the Next 5 Years	Type of Training	Certification Body	Possible Funders	Total training cost (in ₹ Crores)
Air Quality Management – General	Data Scientist	6	Moderate	300	Short-term Tailored Training Programme	SCGJ	NCAP, multilateral/bilateral agencies, self-funded, company-funded	1
Ambient Air Quality Monitoring	Monitoring Specialist	6	Moderate	150	Short-term Tailored Training Programme	SCGJ	NCAP, CPCB/SPCBs, multilateral/bilateral agencies, self-funded, company-funded	0
Area Source	Specialist	6	Moderate	100	Short-term Tailored Training Programme	SCGJ	NCAP, multilateral/bilateral agencies, self-funded, company-funded	3
Stationary Source	Specialist	6	Moderate	1,000	Short-term Tailored Training Programme	SCGJ	NCAP, multilateral/bilateral agencies, self-funded, company-funded	3
Air Quality Planning	Sector Expert	7	Moderate	50	Advanced Course	SCGJ	NCAP, CPCB/SPCBs, multilateral/bilateral agencies, self-funded, company-funded	0
Policy and Regulation	Sector Expert	7	Moderate	100	Advanced Course	SCGJ	NCAP, CPCB/SPCBs, multilateral/bilateral agencies, self-funded, company-funded	0
Air Quality Management	Programme Head/ Project Head/ Department Head	8	Moderate	1,000	Advanced Course	SCGJ	NCAP, CPCB/SPCBs, multilateral/bilateral agencies, self-funded, company-funded	2
Mobile Source	Junior Lab Scientist	4	Low	0	NSQF Level Aligned Course	SCGJ	NCAP	0
Mobile Source	Lab Scientist/ Monitoring Manager	5	Low	0	Short-term NSQF Aligned Training Programme	SCGJ	NCAP, CPCB/SPCBs, multilateral/bilateral agencies, self-funded, company-funded	0
Stationary Source	Monitoring Manager	5	Low	250	Short-term NSQF Aligned Training Programme	SCGJ	NCAP, CPCB/SPCBs, multilateral/bilateral agencies, self-funded, company-funded	2

Sector/Sub-sector	Job Role	NSQF Level	Training Priority	Trainees to be Trained in the Next 5 Years	Type of Training	Certification Body	Possible Funders	Total training cost (in ₹ Crores)
Stationary Source	Supervisor APCD (Including O & M)	5	Low	1,500	Short-term NSQF Aligned Training Programme	SCGJ	NCAP, CPCB/SPCBs, multilateral/bilateral agencies, self-funded, company-funded	17
Mobile Source	Monitoring Specialist	6	Low	0	Short-term Tailored Training Programme	SCGJ	NCAP, multilateral/bilateral agencies, self-funded, company-funded	0
Stationary Source	Monitoring Specialist	6	Low	100	Short-term Tailored Training Programme	SCGJ	NCAP, multilateral/bilateral agencies, self-funded, company-funded	0
Stationary Source	APCD Specialist	6	Low	25	Short-term Tailored Training Programme	SCGJ	NCAP, multilateral/bilateral agencies, self-funded, company-funded	0
Area Source	Sector Expert	7	Low	200	Advanced Course	SCGJ	NCAP, CPCB/SPCBs, multilateral/bilateral agencies, self-funded, company-funded	1
Mobile Source	Sector Expert	7	Low	50	Advanced Course	SCGJ	NCAP, CPCB/SPCBs, multilateral/bilateral agencies, self-funded, company-funded	0
Stationary Source	Sector Expert	7	Low	50	Advanced Course	SCGJ	NCAP, CPCB/SPCBs, multilateral/bilateral agencies, self-funded, company-funded	0
Total Training Delivery Cost (₹ Crore)				**9,46,225**		**SCGJ**	National Skill Development Corporation, Ministry of Urban Development, National Safai Karamcharis Finance & Development Corporation (Ministry of Social Justice & Empowerment), NCAP	**969**

Annexure 7: List of participants in the expert consultation workshop

S. No.	Salutation	Name	Designation	Organization Name
1	Mr.	Ajay Deshpande	Adjunct Professor	IIT Bombay
2	Mr.	Akshay Nayak	Research Fellow	IIT Roorkee
3	Mr.	Amandeep Dubey	Leadership Trainer	Freelance
4	Mr.	Anil Gupta	Senior Manager	Ex-NTPC
5	Mr.	Anurag Swarnkar	Research Fellow	IIT Roorkee
6	Mr.	Arpit Sharma	Chief Operating Officer	Skill Council for Green Jobs
7	Mr.	Arpo Mukherjee	Senior Programme Associate	iFOREST
8	Mr.	Arunesh Karkun	Research Associate	CPR Delhi
9	Mr.	Ashish Gupta	Director	Envirotech Instruments Pvt Ltd.
10	Mrs.	B. Padma S. Rao	Chief Scientist	CSIR NEERI, Nagpur
11	Mr.	Bhargav Krishna	Fellow	CPR
12	Dr.	Bhola Ram Gurjar	Professor	IIT Roorkee
13	Mr.	Chandra Bhushan	President & CEO	iFOREST
14	Dr.	Chandra Venkataraman	Professor	IIT-Bombay
15	Mr.	Deepak Rai	Head-Standards	Skill Council for Green Jobs
16	Dr.	Gufran Beig	Professor	National Institute of Advanced Studies

S. No.	Salutation	Name	Designation	Organization Name
17	Mr.	Gary Kleiman	Senior Environmental Specialist	World Bank
18	Mr.	J. S. Kamyotra	Ex. Member Secretary	CPCB
19	Dr.	Karan Madan	Additional Professor	AIIMS
20	Mr.	Moqtik Bawase	General Manager	Arai
21	Mr.	Nimish Singh	Associate Fellow	TERI
22	Dr.	P. Dhamija	Advisor	Skill Council for Green Jobs
23	Dr.	Pratima Singh	Research Scientist	CSTEP
24	Dr.	Praveen Saxena	Chief Executive Officer	Skill Council for Green Jobs
25	Dr.	Radha Goyal	Deputy Director	Indian Association for Air Pollution Control
26	Mr.	Rahul Kumar	Senior Programme Associate	iFOREST
27	Mr.	Ronak Sutaria	Founder & CEO	Respire Living Sciences
28	Mr.	S. K. Gupta	Chairman	Envirotech
29	Dr.	S. N. Tripathi	Senior Professor	IIT Kanpur
30	Dr.	Sachin S. Gunthe	Professor	IIT Madras
31	Mr.	P.K Gupta	Scientist F	CPCB
32	Ms.	Sakshi Batra	Scientist C	CPCB
33	Mr.	Sanjeev K. Kanchan	Advisor	International Centre for Sustainable Carbon
34	Mr.	Sarvesh Pratap Mall	Senior Manager - Technical	Skill Council for Green Jobs
35	Mr.	Sayantan Sarkar	Technical Specialist	World Bank
36	Dr.	Sharad Gokhale	Professor of Environmental Engineering	IIT Guwahati

S. No.	Salutation	Name	Designation	Organization Name
37	Ms.	Srestha Banerjee	Director	iFOREST
38	Mr.	Sundeep Singh	Scientist F and Additional Project Director	MOEF&CC
39	Ms.	Tanushree Ganguly	Programme Lead	CEEW
40	Mr.	Veerendra Sahu	Research Fellow	IIT Roorkee
41	Mr.	Vijay Kumar Soni	Scientist F	IMD

Endnotes

1 National Knowledge Network 2022, accessed 1June 2022, https://nkn.urbansciences.in/members-of-nkn/

2 Impact of air pollution on health, Rajya Sabha Starred Question no. 20 (To be answered on 03.02.2022). Available at https://pqars.nic.in/annex/256/AS20.pdf

3 National Knowledge Network 2022, accessed 1June 2022, https://nkn.urbansciences.in/members-of-nkn/

4 The study was commissioned as part of the Technical Assistance (TA) programme on AQM for the Government of India, for a period of three years (2019-22). The TA was funded from the Pollution Management and Environmental Health (PMEH) Multi-Donor Trust Fund.

5 Developing skilling content for Indian Learners, NSDC 2019

6 Jyoti K. Parikh et.al. Providing Clean Cooking Fuel in India: Challenges and solutions, The International Institute for Sustainable Development and Integrated Research and Action for Development (IRADe), 2016

7 https://economictimes.indiatimes.com/industry/energy/oil-gas/india-becomes-worlds-2nd-largest-lpg-consumer-after-governments-ujjawla-push/articleshow/67849012.cms?from=mdr

8 https://pib.gov.in/Pressreleaseshare.aspx?PRID=1685058

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10 https://timesofindia.indiatimes.com/india/mumbai-bengaluru-in-top-10-world-cities-on-congestion-parameters/articleshow/89447050.cms

11 https://www.news18.com/news/auto/why-india-needs-to-give-cyclists-pedestrians-their-own-space-on-road-opinion-2600847.html

12 https://moef.gov.in/en/about-the-ministry/introduction-8/

13 https://cpcb.nic.in/

14 Reference has been taken from Odisha Pollution Control Board (available at http://ospcboard.org/constitution-of-spcb/#:~:text=To%20advise%20the%20State%20Government,prevention%2C%20control%20or%20abatement%20thereof.

15 Pg. 171, The complete Fifteenth Finance Commission Report 2020-2021, Accessed on 22.02.2022 (http://finance.cg.gov.in/15%20Finance%20Commission/Report/XVFC-Complete_Report-E.pdf)

16 In Karnataka, municipal councils are of two categories: city councils and town councils, elsewhere there are municipal councils or municipalities.

17 Nagar panchayats are known as notified area committees in Bihar and Jharkhand, notified area authorities in West Bengal, town area committees in Jammu and Kashmir, town committees in Nagaland, notified area councils in Orissa, and town panchayats in Tamil Nadu.

18 https://nkn.urbansciences.in/institute-of-repute/

19 https://cpcb.nic.in/categorization-of-industrial-sectors/

20 https://cpcb.nic.in/upload/List-Recognized-Laboratories/Status-Recogn-GovtLab-June-2021.pdf

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