External mid-term evaluation of the Swiss Clean Air Project in India (CAP India)

Phase 1

Final Report (draft)

Client: Swiss Agency for Development and Cooperation (SDC), Embassy of Switzerland, New Delhi

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EXECUTIVE SUMMARY

Overview of the purpose, context, evaluation process

Ambient air pollution is a major problem in India. To tackle the problem the Government of India (GoI) launched the National Clean Air Program (NCAP) in 2019. As part of its Global Program on Climate Change and Environment the SDC supports the Indian government in improving its air quality. In 2019 the SDC started the implementation of the first phase of its Clean Air Project in India (CAP India). CAP India's aim is to "support India's efforts to improve people's health and well-being through better air quality, while contributing to environment and climate change mitigation." In order to achieve this aim, the project focused on the following three outcomes:

- Improved data measurement and analysis on clean air;
- Enhanced capacities of city and state authorities to implement clean air policies and action plans;
- Awareness for clean air action is raised.

The project is being implemented for four non-attainment cities (Lucknow, Kanpur, Pune and Nashik), is in line with NCAP and has both a scientific and an implementation component led by respectively the Paul Sherrer Institute (PSI) and The Energy and Resources Institute (TERI).

Key achievements

To better understand the air quality problem in the selected cities the necessary data was collected including emission inventories, air quality modelling and source apportionment (SA), recommendations were provided on how to improve the monitoring network and the monitoring itself and training programs were organised on the measurement and the analysis of air pollution, by particulate matter (PM) and major gaseous pollutants. For the SA it can be noted that besides classical SA as required by NCAP, also state of the art advanced SA measurements were done. Such advanced SA studies provide new insight into particle size distribution and formation and the diurnal patterns of chemical composition and size distribution for PM and are important to better understand the processes underlying observed PM concentrations in this part of the world.

To enhance the capacities of city and state authorities to implement clean air policies and action plans, GAINS, a model for assessing the effects of emission measures was introduced, and SA measurements were used to improve the action plans. To follow up on the implementation of the action plans, a monitoring, review and verification (MRV) framework was developed. To test possible emission abatement measures in practice, four pilot projects were implemented: an audit system for mechanical road sweepers, the monitoring of chronic pollution hot spots, the electrification of old, depreciated 2-wheelers and testing guidelines for reducing emissions from construction sites. Finally, also capacity building programs were organised for stakeholders of specific sectors.

Successful implementation of clean air action plans will require a broad support of the population. To raise awareness, activities were organised targeting students, the broad public and the media through workshops, training programs and community events but also newspaper and other articles, digital posters and videos.

Overall assessment

Relevance/coherence: The outcomes of the intervention reflect the needs and priorities of the stakeholders and are in line with the Indian NCAP. For most outputs, the design was appropriate, however for the pilot projects the design could have been better. The process for

selecting the pilot projects took a long time and it was difficult to raise enough interest from the cities. The pilots were also developed without an actual quantification of the feasibility of scaling them up afterwards. Coherence with other initiatives such as the World Bank initiative for the Indo-Gangetic Plain would be higher if the intervention had also looked beyond the air quality in the cities and districts. Such a State-wide/airshed approach would also be in line with NCAP considerations for State-wide action plans.
Other points that affected the relevance of the outcomes include the late provision of results (emission inventory, source apportionment) that affect other activities that depend on those results and the lack of distribution of the advanced SA results to more stakeholders. Some activities were also downscaled and not realised in all four cities as was initially foreseen.

Effectiveness/Impact: The project modelling and measurement outcomes contribute to a better understanding of the air quality issues not only in the four partner cities but in India in general. The project outcomes were well received by the stakeholders. Actual uptake of the results in the action plans will require continued interaction and communication with those responsible. The capacity building activities were well chosen but some could have been better tailored to the capacity of the stakeholders. There is clearly a need for capacity building as the impact is to some extent affected by some stakeholders lacking basic insight to benefit from the reports and the project results. As most of the courses had to be delivered on-line due to COVID, their effectiveness and impact was affected. In-person courses would have been better. The effectiveness and impact of the training programs was also hardly assessed by the project members.

Efficiency: In general, the intervention is acceptably managed. Most of the delays are due to COVID and did not jeopardize the project. While there were regular meetings between the research and implementation components, an overarching management for the two components together would have been preferable. Better communication between the two components would also have ensured that these could have benefitted more from each other's results.

Sustainability: The Indian project partners (TERI, IITK, NEERI and ARAI) have indicated that they now possess the skills to continue the activities similar to those dealt with in the project, independently. Most outputs can also be replicated to other cities.

Recommendation for the remaining project

The missing outputs as listed in Chapter 4 need to be finalised. A final report consolidating all results, as input to the next phase would be useful, especially outlining the appropriate process of developing and following up the establishment of clean air action plans in Indian cities. The advanced source apportionment results should be presented to partners other than IITK and the stakeholders in a workshop where the benefits for NCAP and air quality management in general are outlined in 'layman' terms. Finally, workshops where the different stakeholders present the results and lessons learned for their own cities to each other would be welcome. TERI should work on getting CPCB and SPCBs better on board in the project and consider workshops that would take the outputs better to the stakeholders, and to ensure incorporation of project results into the cities' clean air action plans (CAAP).The relevant project results should be uploaded to the NCAP PRANA portal.

Recommendations for future work

To facilitate and ensure the uptake of project results a good connect with all stakeholders is essential. A memorandum of understanding (MoU) with the federal and state government should be put in place to assure this. The bottom line here is that there has to be a buy in from the federal and from the state government which should be formalized on paper.

It would be useful to have an implementation committee at the state level with representatives of the state PCBs and the Municipal Corporation that work collectively with implementation partners. To not overburden the project meetings should be limited (1-2 a year) and the purpose should be to ensure involvement of all stakeholders to maximise uptake of results.

When setting up the second phase of CAP India, project management should include a single responsible partner instead of the current project structure with separate lead partners for the research and implementation components and without an overarching responsible for both the research and implementation component.

Focus should shift from the city scale to also consider the airshed scale and better account for the significant contribution of sources outside the city/district and the regional character of air pollution while at the same time considering the limited financial and other resources of the project. The project activities could still be at the city scale but should consider the impact of sources outside the city. Such information is for example provided by the World Bank Indo-Gangetic Plain (IGP) project. An MoU with the World Bank to join forces with their initiative for the IGP would be useful. A shift to the airshed scale will also imply considering air quality monitoring and modelling, capacity building and awareness raising activities at that scale.

There should also be a better link to climate change when selecting the measures and pilot projects in a second phase to maximise co-benefits.

The state(s) in which to develop the project in the next phase need(s) to be selected in close consultation with the MoEF&CC, the CPCB and the World Bank to maximise coherence with other projects. Both the option to focus on Uttar Pradesh and contribute to the World Bank initiative for the IGP or to also consider Maharashtra and build on the results of the first phase seem reasonable. As funding is limited the current activities can't all be scaled up to one or more states and choices will have to be made.

All activities considered in the first phase could also be considered for the second phase but when they are included their results should contribute directly to improving the CAAP and a better clean air policy. More specifically:

- Air quality modelling and emission inventories should support clean air policy
- Advanced, real-time source apportionment can contribute to a better understanding and thus more effective approach to solving the air quality problem and the results should fit in with other activities.
- The pilots need to have clear synergies with action plans. When selecting the state(s) in which to implement the project, willingness to implement and to contribute financially to the pilots should be taken into consideration.
- The capacity building should consist of programs and workshops involving both government agencies and the private sector . They should target young high-potential individuals and be more tailored to the trainee's capacity than is the case in the first phase.

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Acronyms and abbreviations

APAG	Air Pollution Action Group
ARAI	Automotive Research Association of India
ASTM	American Society for Testing and Materials
CAAPs	Clean Air Action Plans
CAAQMS	Continuous Ambient Air Quality Monitoring Stations
CPCB	Central Pollution Control Board
DoE	Department of Environment
DoULB's	Directorate Of Urban Local Bodies
EPFL	Ecole Polytechnique Fédérale De Lausanne
GHG	Green House Gas
GoI	Government of India
ICCC	Integrated Command and Control Centre
IGP	Indo-Gangetic Plain
IITK	Indian Institute of Technology Kanpur
IIASA	International Institute for Applied Systems Analysis
ISO	International Organization for Standardization
LMC	Lucknow Municipal Council
MCCIA	Maharashtra Chamber of Commerce, Industries and Agriculture
MoEF&CC	Ministry of Environment, Forest and Climate Change
MPCB	Maharashtra Pollution Control Board
MRS	Mechanical road sweeper
MRV	MRV Monitoring, Review and Verification
NAAQS	National Ambient Air Quality Standard
NAC	Non-attainment city
NAMP	National Air Quality Monitoring Program
NCAP	National Clean Air Program
NEERI	National Environmental Engineering Research Institute
NGO	Non-Government Organization
NMC	Nashik Municipal Council
NMVOC	Non-methane volatile organic compound
PMC	Pune Municipal Council
PMU	Pollution Monitoring Unit
PSI	Paul Scherrer Institute
RT	Real time
SA	Source apportionment
SBM-U	Swachh Bharat Mission - Urban
SOP	Standard Operating Procedure
TERI	The Energy and Resources Institute
UNEP	United Nations Environmental program
UPPCB	Uttar Pradesh Pollution Control Board
USEPA	United States Environmental Protection Agency
WHO	World Health Organization

1 INTRODUCTION

1.1 Project background

Ambient air pollution is a major problem in India. To tackle the problem the Government of India (GoI) launched the National Clean Air Program (NCAP) in 2019. The NCAP aims to reduce particulate matter 2.5 (PM2.5) and PM10 concentrations substantially by 40% by 2026 compared to the 2019 levels. The strategies for mitigating air pollution include a comprehensive array of action points directed at addressing vehicular emissions and industrial pollution, the implementation of the Pradhan Mantri Ujjawala Yojana 2.0 scheme to reduce household air pollution due to cooking on wood, and a host of general measures designed for execution within the confines of the 131 non-attainment cities (NAC) across India. The NAC are those cities where the National Ambient Air Quality Standard (NAAQS) is violated based on the ambient air quality data obtained over the period 2011–2015 under the National Air Quality Monitoring Program (NAMP). A pivotal aspect in the selection of the measures for the NAC involves proposing interventions based on source apportionment studies, including both dispersion modelling using well-structured emission inventories and receptor modelling.

As part of its Global Program on Climate Change and Environment the SDC supports the Indian government in improving its air quality. In 2019 the SDC commenced implementation of the first phase of its Clean Air Project in India (CAP India). The relation between the goals and objectives of NCAP and CAP India are shown in Figure 1.

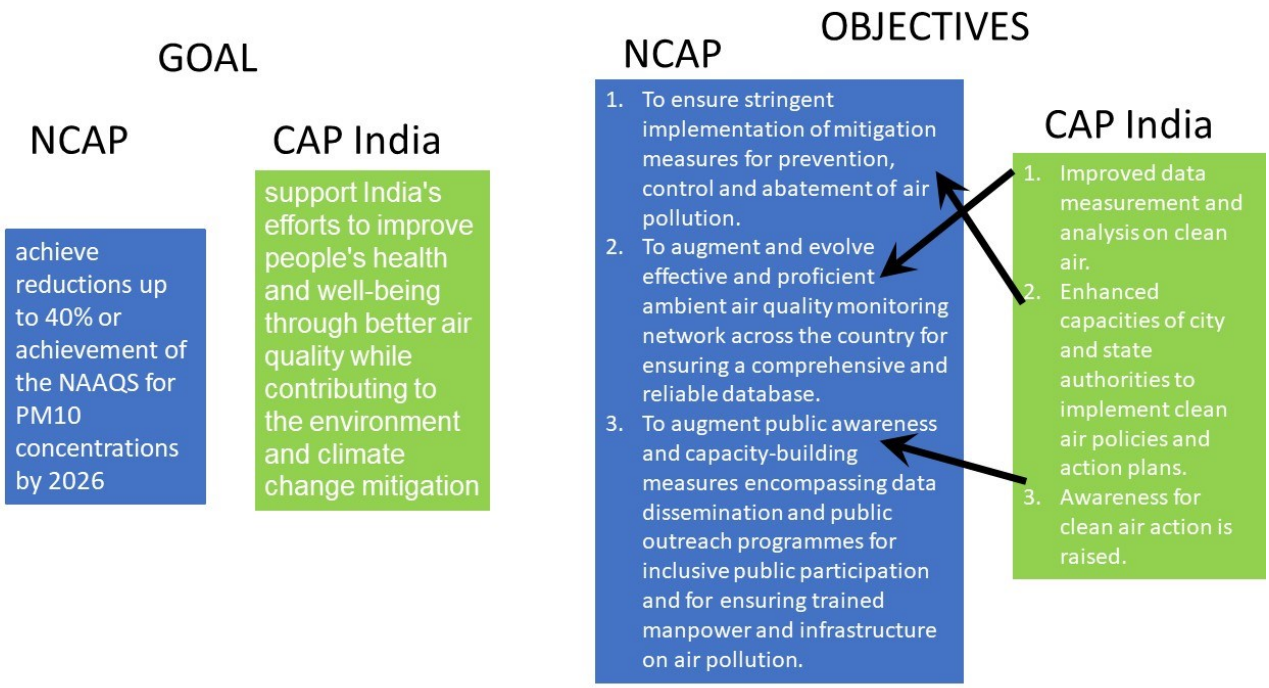

Figure 1: The relation between the goals and objectives of NCAP (blue) and CAP India (green).

The outcomes of CAP India could be of significant use for NACs identified under NCAP. As an illustration, a notable achievement of CAP India involves employing advanced measurement methods, such as real time monitoring of PM components and oxidative species and source apportionment techniques specifically using hybrid CMB-PMF models in two Indian cities. These techniques are notably more sophisticated than the conventional methods employed by NACs. Further, the advanced techniques employed enable the tracking of hourly

variations in source contributions, providing invaluable insights for making action plans during episodes. Consequently, comparing the results obtained through these advanced techniques with those of the conventional source apportionment studies in these cities, these have the potential to prompt the NCAP to reconsider its approach to source apportionment in the future, should such a need arise. Moreover, the emission inventories created at the district level as part of CAP India would prove invaluable in partially evaluating the contributions from sources outside the local area in a given city. This valuable data is assisting NAC regulators in formulating more effective air pollution control action plans. Additionally, the successful identification and implementation of pilot projects in specific high-impact sectors could serve as a model for replication in NACs, offering a path to address mitigation potential effectively.

1.2 Evaluation objectives

The main objectives of the evaluation process are to:

- assess to what extend the project up to now has been able to fulfil the project objectives using the OECD criteria;
- provide recommendations on how to improve the project for the remaining duration of the current phase;
- provide recommendations for the next phase of CAP India.

2 METHODOLOGY

2.1 Evaluation criteria

For the review SDC required that this should be based on the set of criteria prescribed by OECD/DAC[1] and shown in Figure 2.

Figure 2: The OECD evaluation criteria.

Based on these key criteria SDC devised a number of questions that need to be considered in the assessment of the project's achievements during the review. The evaluation team complemented the SDC questions with some additional questions (Annex 1).

[1] OECD/DAC Network on Development Evaluation: Better Criteria for Better Evaluation. Revised Evaluation Criteria Definitions and Principles for Use (2019)

2.2 Sources

Desktop review

During the inception phase documents were provided to the evaluation team for a desk review. A full list is presented in Annex 2.

Interaction with stakeholders and partners

To report about the project implementation and findings, interviews were performed by the review team, most of them during the visit in India. The interviews covered all stakeholder groups, including government officials, academics and international organisations as well as project partners. Ahead of the visit to India online consultations were held with TERI on the logistics to arrange the meetings in India (11 Sept) and with PSI (13 Sept) and TERI and all project partners (21 Sept) to discuss the project. In Annex 3 an overview is presented of all the meetings that were held during the visit to India in the beginning of October.

2.3 Project outcomes

The project has 3 main expected outcomes that are listed below with their main outputs.

Outcome 1: Improved data measurement and analysis on clean air

- Estimated city-wide source contributions of pollutants using air quality model
- Measurement and analysis of sources of PM and its specific health relevant components
- Revised methodologies/protocols for source apportionment, data collection and design of monitoring networks
- Capacity building for data measurement and analysis on clean air

Outcome 2: Enhanced capacities of city and state authorities to implement clean air policies and action plans

- Action plans are strengthened based on scientific studies
- Monitoring, review, and verification (MRV) systems for clean air action plan is developed
- Pilot projects in selected sectors with high mitigation potential in the air shed area of the four cities are demonstrated and supported for up-scaling
- Capacity building programs for different stakeholders

Outcome 3: Awareness for clean air action is raised

- Awareness is raised among school/college students
- General public is sensitized about Air Pollution
- NGO/Media is sensitized about Air pollution
- National and international exposure visit trips

3 EVALUATION

The subchapters below present the 3 project outcomes highlighting the results achieved so far and the likelihood to achieve the intended results followed by an evaluation against the OECD/DAC criteria.

3.1 Outcome 1: Improved data measurement and analysis on clean air

Introduction

To effectively and efficiently address an air quality problem requires insight into which air pollution sources are causing the problem. The goal of this outcome is to bridge the data gaps in the monitoring network and methods used to assess the concentration and identify the pollutant sources. To achieve this the outcome aims at:

- assessing city wide source contribution of pollutant using both top-down (receptor model) and bottom-up (dispersion model) methods to estimate source contributions towards prevailing ambient concentrations of PM and major gaseous pollutants;
- revising methodologies/protocols for source apportionment (SA), data collection and design of monitoring networks to derive more accurate results and analyses;
- measurement and analysis of sources of PM and its specific health relevant components;
- technical capacity building of local stakeholders through a series of training programs on various aspects of monitoring, data collection and SA.

Achievements

Air quality modelling

The activity aims at using both top-down (receptor model) and bottom-up (dispersion model) source apportionment (SA) methods to estimate source contributions to prevailing ambient concentrations of PM and major gaseous pollutants.

The project has provided five emission inventories (EIs) and reports for these EI for the four focus cities to respective SPCBs and Urban Local Bodies **(**ULBs) (Table 1). Two of these were for Kanpur where 2 districts were considered. In Lucknow, micro-grid action plans were developed based on the EI for that city.

Table 1: Emission inventory and dispersion model outputs.

City	Emission inventory		Dispersion modelling		
	Finalised	Reported	Finalised	Reported	Projections
Lucknow	Yes	Yes	Yes	Yes	No
Kanpur	Yes	Yes	No	No	
Pune	Yes	Yes	Yes	Yes/Not submitted	
Nashik	Yes	Yes	No	No	

It is to be expected that the project partners will finalise the dispersion modelling and report this to the stakeholders. Actually using the dispersion models afterwards for assessing scenarios and projections seems unlikely for all cities given the project time that is still left.

Source apportionment of PM Sources

The SA activities aim at using off-line (classic) receptor modelling and also on-line (advanced) receptor modelling using advanced measurements based on mass spectrometry. On-line SA

measurements were carried out for 6 months in both Pune and in Lucknow. Two approaches are planned to carry out the receptor-oriented source apportionment using the measurement results. In the other two cities, Nashik and Kanpur, additional classic offline measurements may be considered. For the SA the following activities realised in the context of CAP India are presented in Table 2.

Table 2: Status of the source apportionment activities in the four cities realised for CAP India.

City	Number of sites		Status of completion		Status of reporting	
	Classical	Advanced	Classical	Advanced	Classical	Advanced
Lucknow	5	2	Ongoing	Feb/March 2024	Yet to be reported	Partially published/presented
Kanpur	NA	NA	NA	NA	NA	NA
Pune	NA	2	NA	Feb/March 2024		Yet to be reported
Nashik	2	NA	Ongoing	NA	Yet to be reported	NA

Note: All numbers are for measurements done in the context of CAP India and not the measurements that are foreseen for NCAP or other projects. 'NA' indicates non applicable/ not planned in this study.

As can be seen in Table 2 all of these activities are still ongoing or are expected to be finalised by March 2024. This raises concern to whether this all will still be completed, but the PSI has confirmed that these ongoing and planned activities will be finished and reported by the end of the project.

Source apportionment protocols and monitoring network design

This activity resulted in two reports:

- Assessment and optimisation of the air pollutant measurement station network: Report "Detailed report on Strategies for improving air quality monitoring" (EPFL, 2021)
- Revision of the protocol for the calibration of air quality instruments in the four cities: Report: "Ambient air quality monitoring and calibration of instruments" (IITK, 2021)

Other activities

- Revised standardized templates for data collection have been shared with UPPCB and will be shared with MPCB in the next training program
- State-of-the-art measurement techniques for PM components for improved SA were introduced by PSI (capacity building)
- Reports and training were provided on how to improve the monitoring network and the monitoring itself including specific recommendations on where to install new stations in Pune;

Capacity building

According to the Project Document a total of 16 training programs, 4 in each of the 4 cities, were foreseen for outcome 1 to train at least 240 Government or Academic personnel.

During the project so far 11 training programs were organized in which 331 Government or Academic personnel were trained:

- A two-day in-person training program on “GAINS Asia Model” was conducted in Lucknow and Pune in December 2022 for SPCBs, Dept of Environment, and Environmental Agencies. 57 and 20 participants at Lucknow and Pune, respectively.
- A two-day in-person training program on “Air quality monitoring, Emission inventory and Source apportionment of Particulate Matter” in Lucknow (for UPPCB officials) and in Pune (for PMC and MPCB officials) –32 and 9 participants, respectively.
- A 3-days training program on ‘Control of Air Pollution, Source Apportionment Studies and Preparation of Emission Inventories – 25 participants.
- A two-days training program on Urban Air Quality Management – attended by 30 participants.
- A two-day training program was conducted on ‘Air Quality Monitoring and Management’ – attended by 19 participants.
- A two-day webinar series on advanced source apportionment methodology and introduction to the Source Finder (SoFi) by PSI program attended by 25 participants.
- Two capacity building workshops at UPPCB and IITK on “Advanced techniques to monitor air quality” in Lucknow and Kanpur – attended by 12 participants in each.
- A seven-day webinar series on ‘Air Quality Management' across four cities attended by 20 participants.

Due to COVID 5 out of 8 of the capacity building activities were online. For in person training programs, 3 were organised in Lucknow, 2 in Pune, 1 in Kanpur and none in Nashik. The capacity building activities are still ongoing so that at the end of the project a total of 16 training programs are still likely.

Relevance/coherence

The activities planned and undertaken within this outcome are all relevant to better understand what is causing the air quality problem and remediate the problem. They are also coherent with the actions that are part of NCAP.

- Air quality modelling can be used to assess air pollutant concentrations in locations where measurements are lacking, and the effect of each emission sector and emission abatement strategies;
- The district level emission inventories created for all cities during CAP India contribute to improving the national level database and could also be used to validate the latter.
- Source apportionment is needed to identify the main emission sources that are contributing to the problem. SA studies that are produced in line with the NCAP requirements for such studies are of direct utility to NCAP. This is the case for Lucknow where the study was completed and reported. .
- The PSI advanced SA studies provide new insight into particle size distribution and growth formation in the cities and the diurnal patterns of chemical composition and size distribution for PM in these cities. Such advanced analysis is very rare in this part of the world and is missing in most of the other classical SA studies carried out in India and are essential to better understand the processes underlying observed PM concentrations in this part of the world;
- An optimised monitoring network will result in more and better information on the air quality. The air quality monitoring network is one of the actions for knowledge and database augmentation for NCAP;

- Capacity buildling is essential as in the end people will need to apply and interprete all of the above correctly. The topics covered in the different training courses are all necessary to address air quality problems. Training and capacity building is also one of the actions for institutional strengthening of NCAP. Some of the hurdles in an effective implementation of air pollution management plans in India are a lack of capacity on air quality issues in the CPCB and SPCBs, a lack of formal training for various associated stakeholders and a limited number of trained individuals in air quality management.

Some of the outputs, however, could have been even more relevant and coherent:

- Air quality modelling requires a whole set of inputs which need to be collected and processed and because of this the modellng results are often, as is the case here, only available at the very end of the project. The most interesting part of the modelling where the model is then used to calculate results for policy scenarios and projections that are selected together with the stakeholders and for which the results are then discussed with these stakeholders is now difficult if not impossible to achieve in the remaining time for the first phase of the project;
- As a significant part of the air pollution can't be attributed to local sources, it makes more sense to consider not only the local sources when devising air quality plans. The emission inventories in CAP India were realised at the district level which is a step in the right direction when one wants to move beyond the city level and consider the impacts of sources outside the cities. The World Bank is currently establishing State-wide air quality management programs that consider the Indo-Gangetic plain (IGP) airshed instead of individual cities. To be in line with the World Bank initiative the EI will need to cover even larger areas. As a full coverage of the larger area at 2 km resolution could be too expensive, areas with lower emissions and where the 2 km resolution required by NCAP is not necessary could be covered with a lower resolution in the EI (such as 10x10 km as used in the World Bank IGP projects) while the areas that correspond to NAC could be included at the 2 km resolution required by the NCAP. The EI work would then be useful for both NCAP and a project that considers the IGP airshed.
- The PSI advanced SA studies, while indisputably of scientific significance, were up to now only shared with IITK and the scientific community. A broader distribution of main results among the project partners and stakeholders taking into account how these could benefit from the results of the advanced SA would have made these results more relevant to the whole project. The project partners could have reused the results to improve or validate their own modelling results.
- For Pune, the MPCB was advised on where to add additional monitoring stations, but similar advise for the other cities is not available. Specific work between the EPFL and city stakeholders to design an improved monitoring network in each city (number, locations and types of stations would have been expected and been very useful for all the cities.

For UNEP a uniform, replicable approach to air quality management is essential. The following activities of outcome 1 contribute to the latter:

- In the case of the emission inventories the same methodology was adopted for all four cities.
- The report on "Ambient Air Quality Monitoring and Calibration of Instruments" refers to standards published by USEPA, ASTM and ISO and is as such consistent with existing international good practice. The monitoring networks in the four cities were assessed

according to the CPCB guidelines. As these CPCB guidelines for monitoring networks were drafted by closely following WHO and USA guidelines, the evaluation of the monitoring networks is also in line with those international guidelines.

Effectiveness/impact

The EIs have been produced and the reports delivered to the authorities. For the dispersion modelling only the report for Lucknow was available at time of writing. The report for Pune still needs to be submitted and for Nashik and Kanpur the dispersion modelling is ongoing. Assuming the latter are achieved in the remaining time of the project, the objective is achieved.

The reports were delivered and presented to the stakeholders but apparently some stakeholders lack the insight to actually benefit from the reports. Training targeting specific staff combined with tailored presentations could solve this. All the EI reports were adopted and released by the authorities. During the contacts it was observed that some of the stakeholder personnel had not yet read the EI reports that had been submitted while others had indeed looked at these and provided feedback. In general authorities indicated that the EI was useful.

To enhance confidence in model results these should be validated. This validation should be part of the work delivered by the project partners and was currently only done for a few of the outputs. Another point worth emphasizing is the use of air quality modelling for projections which is one of the main advantages of using modelling. This is also foreseen in the ProDoc for the project. Using the models for quantifying the effects of planned emission abatements and presenting these results to the administration would strongly advocate the case for using air quality modelling in the context of air quality management and action plan development by the administration.

The receptor-oriented SA should have been completed by the first quarter of 2023 but are delayed due to COVID. While some of the results of the advanced SA study have been reported in scientific literature, some of the data of the advanced SA are still being processed. PSI has confirmed that all results would be available by June 2024. The implementation team is also carrying out additional on-field measurements in Nashik at two sites to validate their dispersion modelling results. Further, in addition to the advanced SA carried out by PSI's team, classical SA is being carried out at five sites in Lucknow by TERI. The site selection and subsequent analysis follows the recommended protocol of CPCB. This is another unplanned (i.e. not in original proposal) activity carried out in this project. The classical SA results were or will be reported and presented to the relevant authorities and could be used in the context of NCAP.

The two reports on monitoring and monitoring networks were delivered in 2021 and fulfil part of the objectives of the project. No reports were (yet) seen describing the results of optimization procedures to ascertain numbers and locations of an enhanced monitoring network in each of the four cities (see ProDoc 5.2.3.1). The standardised template for data collection has been provided to UPPCB and will also be provided to MPCB during a training program before the end of the project. The report on air quality monitoring stations has not (yet) resulted in updates to the guidance on PRANA with respect to monitoring. The MPCB has been advised on appropriate locations for additional monitoring stations, but this has not (yet) resulted in actual modifications to the monitoring network. Such an update of the monitoring network will require a significant investment from the state.

There is no actual impact of the outputs on the Clean Air Action Plans (CAAPs) that were already developed at this point, but the administrations indicated that this would be the case

in the future. The main reason for the limited uptake is that documents were not available when the CAAP were established and/or the activity is still ongoing. In the discussions with the city authorities these do not mention the air quality modelling results while these would be even more useful in the CAAP development process than the EI.

The project should be able to deliver on the number of training courses and trainees that were foreseen in the ProDoc by the end of the project. Unfortunately most of the courses were online and none of the in person sessions took place in Nashik. The online courses were probably less effective than the in-person courses. The majority of the participants to the online course in Nashik indicated they would prefer to have an in-person course.

For the training on the advanced SA by PSI no formal feedback was found. The training was only for project participants which is understandable in view of the complexity of the topic. A 'layman' presentation of the topic to stakeholders highlighting how advanced SA could also contribute to NCAP and air quality management in general would have represented an added value to the utility of advanced SA in the project.

It is difficult to assess the actual effectiveness of the training. Feedback on the quality of the course was found for the 'Air quality monitoring Emission inventory and Source apportionment of PM' course organised by ARAI in Pune where overall very positive feedback was provided by 6 of the 9 participants. An assessment based on actual testing the trainees´ knowledge before and after the training would have been better.

No direct, short-term impact to policy processes is to be expected from capacity building but in the long term, assuming the training is effective, an impact can be expected. From our own interactions it is obvious that not all local stakeholders involved in air quality management have enough background to fully benefit from training courses. This was also pointed out by Mr Tiwari (UPPCB): training should preferably focus on high potential, young people. A further distinction between basic courses that assure the trainees understand the fundamentals and more advanced courses that require a specialist background could also help.

Efficiency

The project was organised according to a scientific and an implementation component each of which have their respective coordinating partner, PSI or TERI. Formally there was no overarching coordination for both components, but in practice TERI took on this role informally also for tasks that should have been handled by PSI or IITK. A formal project lead for both components together would have been better, and probably more efficient.

The EI compilation was efficiently managed. At the onset of the project a common methodology was established for compiling the emission inventory. This approach resulted in a uniform and comparable result for all four cities. The resulting EIs can therefore if needed easily be combined. A similar approach to dispersion modelling would have been good.

For the advanced SA that was done in the scientific component, COVID made direct physical cooperation difficult if not impossible. Regular online meetings between PSI and IITK did however allow for the necessary knowledge transfer and work to progress although there is an obvious delay and as a result not all data has been processed.

For Pune, PSI cooperated with NEERI who did the classical, filter-based analysis. Due to a misunderstanding this analysis was done incorrectly and the analysis is now being repeated in Switzerland. Better coordination between the two partners could have avoided this. NEERI will possibly also benefit from the Swiss reanalysis of the filters.

The classic SA done by partners in the implementation component, was done independently of the work in the scientific component. Better initial coordination, which is lacking in the project workplan on the SA between the two components, would have allowed for collocating measurements so that these could have been more useful for validating each other.

The implementation of the EI and the SA results, both by dispersion modelling and receptor modelling, will require follow-up by project partners to ensure that the results are actually used and contribute to policy formulation and action plan development by the authorities.

The recommendations for updating the Clean Air Action Plan (CAAP) for Lucknow for outcome 2 were based on SA (receptor model) results. A first version was based on existing SA results but these were during the project replaced by the more recent SA results obtained during the project. Concerning the advanced SA the PCBs and local authorities were not aware of this activity or where the measurement sites were. During the discussion it was observed that SA is also not always fully understood by all in the administration. If considered as merely an extension of air quality monitoring, the utility of measuring additional pollutants, as is the case for SA, is not obvious to the administration.

In general, administration officials were more aware of the source apportionment activities than those on improving the monitoring. This is maybe because the monitoring activities were "on paper", and did not include actual design and plans for improving the network, whereas SA resulted in actual measurement campaigns some of which directly contributed to NCAP for the cities. In Pune however the MPCB did mention the recommendations for additional monitoring stations

For the capacity building activities, the main personnel involved was from the institutions at the locations where the courses take place: TERI in Lucknow, IITK in Kanpur, ARAI in Pune and NEERI in Nashik with back up by TERI for all locations. The combination of local partners to provide training with a single partner keeping an overview ensured training material and information was exchanged between partners if needed and was an efficient way to manage this.

The training sessions were endorsed by the administration. For the course 'Air quality monitoring Emission inventory and Source apportionment of PM' organised by ARAI in Pune in February 2022 two of the respondents remark that more and higher levels of administration personnel should be involved. TERI intends to integrate the feedback into the courses when these are organised again. A general problem mentioned by the project partners that needs to be addressed by NCAP leadership is the large turnover of personnel responsible for the air quality management at the city level.

Not all courses were organised in all cities. In some cases this is logical as the MRS course in Lucknow was specific to the MRS pilot in that city. For courses that were organised in multiple cities it would have been a good idea to have an inter-city discussion session after the individual training sessions where the cities could have exchanged their experiences and thoughts on the topic(s) addressed in the training sessions. This would then also have been an opportunity to assess to what extend the training material had been assimilated by the participants and where a follow up course could help.

Sustainability

The compilation of EI is an activity that the institutes involved (ARAI, NEERI, TERI, IITK) are well familiar with. The developed methodology which is well documented can be applied by all these institutes but could also be adopted by others having the necessary data processing

skills and access to data. For updates the administration relies on external data providers, so mastering the skills required by the applied methodology by the administration is not really necessary. The methodology developed for the EI could also be applied in other cities.

Knowledge transfer/coordination regarding online-offline measurements and advanced source apportionment with IITK is clear from the joint publications of the team with PSI. The IITK research team also indicated that they are now capable of doing such studies independently. However, more workshops could be conducted with other relevant stakeholders in the country as the know how is now very much concentrated at IITK.

The classic SA measurements were done by Indian partners and the know how to do this is available with these partners. The SA could be rolled out to more cities but the main obstacles will be the cost and the limited number of institutes that can actually carry out SA.

The recommendations on the monitoring stations and the monitoring network as well as the templates for data collection can be adopted by other cities.

Courses for which training material such as manuals and presentations are available, could be organised again in the future without much additional effort.

3.2 Outcome 2: Enhanced capacities of city and state authorities to implement clean air policies and action plans

Introduction

Where the previous outcome focuses on the methodology to better understand and tackle the air quality problem, this outcome wants to empower the Indian authorities so they can take the right measures to improve the air quality in the four cities. To achieve this the outcome relies on the following activities:

- the existing clean air action plan will be reviewed and strengthened based on scientific studies;
- establish the framework for a monitoring, review, and verification (MRV) system for the revised clean air action plan;
- pilot demonstration of some of the interventions in key sectors;
- focused capacity building programs for different stakeholders like local level consultants, operators and technicians in industries, which in many cases don't have in-depth knowledge.

Achievements

Strengthening of the action plans based on scientific studies

- Capacity building workshops on the GAINS ASIA model were held for the state government authorities and researchers in Pune and Lucknow. Greenhouse Gas and Air Pollution Interactions and Synergies (GAINS) is a model to assess emission and pollution reduction strategies that combat air pollution and climate change simultaneously that was developed by the International Institute for Applied Systems Analysis (IIASA);
- The report 'Prioritising Actions In Existing Clean Air Action Plans Through Stakeholder Consultations in Pune and Nashik' (TERI/ARAI, 2020) lists the prioritized actions for Pune and Nashik. This was shared with the MPCB and resulted in an update of the CAAP they had submitted;
- For Lucknow the Clean Air Action Plan (CAAP) will be revised based on source apportionment results. There is no report on this, so ongoing.

Monitoring, review, and verification (MRV) system for clean air action plan is developed

For the MRV the following outputs have been realised or are planned before the end of the project:

- The report 'Monitoring, Reporting and Verification (MRV) framework for Clean Air Action Plan (CAAP) for the city of Lucknow' was produced by TERI in 2022;
- A concept note on developing a summary of the European experience in MRV framework for clean air action plan has been prepared.

Pilot projects in selected sectors with high mitigation potential in the air shed area of the four cities are demonstrated and supported for upscaling

According to the original plan outlined in the project document it was the intention to have at least 3 pilot projects based on the existing CAAP and existing source apportionment studies as no regret measures with high mitigation potential in 4 cities. The rest of the pilot demonstrations (at least 3 more) would then be identified after strengthening of clean air action plans on the basis of new source apportionment studies.

The following pilot projects will be realised by 2024. Notice that none of these are in Nashik:

- Camera Installation for chronic pollution source monitoring and establishment of Pollution Monitoring Unit (PMU) (Lucknow);
- Establishment of model construction site and preparation of a handbook that contains guidelines for builders to adopt at the construction site to mitigate dust emissions and a checklist to the regulatory body to ensure the implementation of the procedures at the construction site. (Kanpur and Lucknow). This resulted in a “Handbook of Clean Construction Practices in Uttar Pradesh” by TERI in 2022;
- Retrofitting of old IC 2-wheeler to EV (Pune);
- Mechanized road sweeper (MRS) audit system (Lucknow) which has been integrated in the smart city portal. June 19-22, 2023 there was a workshop on MRS in Lucknow.
- There is also an additional project on electric tandoors.

Capacity building programs for different stakeholders

The current status on the different capacity building programs is presented in Table 3.

Table 3: Expected and realised capacity building programs.

Training	Expected	Realised
MRV framework	8 (2 in each city) 2 day programs	Two training programs on MRV framework, one in each state, are currently being planned in Jan 2024
Pilot projects	6 (one for each pilot project) 1-2 day programs	1 The modern construction site guidance will be presented at the NCAP regular meeting for all the NAC; 2 The pilots have been presented to the stakeholders for the city where these were implemented; 3 The commissioning of the pilot demonstrations and the learning and experiences will be captured and shared with the national and state level stakeholders by February 2024.
Sector specific training for major sectors	8 (2 for each city) 3-day programs	4 training workshop – 2 in Pune and 2 in Nashik on ‘Clean Technology Options for Industries’ organized for the industrial stakeholders in Pune and Nashik in collaboration with Mahratta Chamber of Commerce Industries and Agriculture (MCCIA) - attended by 113 participants

Relevance/Coherence

All the proposed activities are relevant to achieve a better ambient air quality. NCAP relies on city-specific air quality management plans for non-attainment cities and state action plans to achieve its goals. Enhancing the capacities of city and state authorities to implement clean air policies and action plans is thus clearly in line with NCAP. The focus in CAP India is however more at the city and/or district level while NCAP also considers state wide air quality management. Broadening the scope of CAP India to airshed scale of appropriate size is desirable

When faced with an air quality problem, the authorities will need to establish a clean air action plan (CAAP) to solve the problem. To help identify the optimal emission abatement measures for a CAAP , air quality management tools such as GAINS have been developed. GAINS is in Europe the *de facto* standard for the European Commission for airshed AQ management. By adopting this tool and methodology, the approach for developing airshed/State-wide action

plans is in line with good international practice. One disadvantage of GAINS that was also noticed by some of the participants to the GAINS training is that the basic spatial resolution of 1° (~100 km) is too low for a detailed assessment at the city level. A higher resolution version of GAINS at 10x10 km resolution was therefore developed for the World Bank IGP studies. The GAINS IGP version also covers natural PM sources. Such natural emissions are in practice of course not targeted by emission abatement measures but taking them into account would better set the stage on what part of the pollution can actually be tackled with measures.

Also a method where the CAAP is assessed based on SA results in combination with consultations to account for stakeholder preferences using a Multi-Criteria Analysis (MCA), was explored in CAP India. According to DEFRA[2], MCA is complementary with cost benefit analysis and the method is very versatile in combining monetary and non-monetary criteria when analysing a multitude of measures, not only according to cost-benefit, but also taking into account acceptance, social benefits and other criteria that are used in the MCA for CAP India.

The recommendations based on the SA studies for the 4 cities are at the more detailed city level, dealing with the local urban sources which is important in itself, but do not consider the significant transboundary contribution to the air pollution in the city. The results of GAINS could in this case be used to corroborate and/or extend the city scale SA based recommendations.

Once the CAAP has been established its actual implementation needs to be followed up. This requires developing a MRV framework. NCAP does not explicitly mention a MRV and no MRV framework has being formulated to track the progress of Clean Air Action Plan (CAAP) however a framework for MRV will support the effective implementation of CAAPs at the city scale.

Implementing abatement measures can require a significant investment. To avoid mis-investments, pilot projects allow testing measures at a smaller scale before actual implementation at full scale. Relevance of the pilot project then depends on the extent to which the pilot project allows assessing the feasibility of implementing the measures at the large scale. For the pilot projects that are proposed the quantification of the monetary costs of scaling up the pilot and establishing the organisational framework with the different actors involved in rolling out the abatement measure is lacking, so the relevance is at times unclear. As one of the mitigation actions of NCAP, technology support is listed. Clean Technologies with potential for air pollution prevention and mitigation will be supported for R&D, pilot scale demonstration and field scale implementation. The pilots as currently being implemented in CAP India were not set up in concertation with any of the existing or planned international projects. UNEP and the World Bank have however been informed about these pilots.

Effectiveness/Impact

Capacity building workshops on the GAINS ASIA model were held for Institutes of Repute (IoRs), SPCBs, Dept of Environment, and Environmental Agencies in Pune and Lucknow. The program of the 2-day training course is well developed and provides participants insight in the underlying methodology but also practical use of the tool. About 20% of the 28 people that attended in Lucknow had used the tool before while 57% had never heard of GAINS before. After the training session 95% considered GAINS to be useful. Feedback from the trainees indicates that most have understood what the tool can be used for and what some of the limitations are. Our assessment is that participants with experience using modelling software

[2] DEFRA 2003 Use of Multi-Criteria Analysis in Air Quality Policy. https://uk-air.defra.gov.uk/assets/documents/reports/cat09/0711231556_MCDA_Final.pdf

will now be able to use GAINS ASIA independently. For those who do not have such experience, they should now be aware that a tool such as GAINS exists that can help them to design and assess air quality management plans on a scientific basis.

The activities to improve the CAAP resulted in recommendations for the four cities for improving their action plans based on SA results. For Pune and Nashik, the action plan was updated based upon the multicriteria analysis (MCA) methodology and the emission inventory. While this will attribute too much weight to industrial/power sources and using dispersion model data would be better, it is a good example of the use of MCA to improve action plans. For Pune, Nashik and Lucknow the recommendations have been provided, for Kanpur this still needs to be done. The local stakeholders and SPCBs that were consulted indicated that the recommendations were relevant to them for developing action plans. Some of the actions proposed to improve the CAAP have been implemented by Lucknow. Actual incorporation of the other recommendations provided by CAP India in existing action plans is however not the case yet. This is at least partially due to the time it takes to do so. In general, however, further efforts such as follow up meetings to clarify the recommendations and ensure that authorities are aware of these results are needed. A more general adoption of the methodology for improving action plans based on source apportionment results using MCA would be possible if the methodology was published on the PRANA portal. The PRANA portal was launched to monitor the implementation of the NCAP in non-attainment cities.

A framework for a MRV was developed and reported by TERI. In India MRVs implemented for initiatives pertaining to GHG mitigation and adaptation have proven to be very useful. By integrated the MRV into the PRANA portal would make it available to all cities in India. PRANA currently tracks the number of proposed CAAPs being implemented but falls short in estimating the outcomes or benefits achieved from full or partial implementation. By extending the PRANA portal with the MRV it would be more useful to the authorities as it will then allow them to also assess the success of the CAAP. The main challenge will then be establishing a proper institutional framework to collect the data and assure that these data are of sufficient quality.

All of the pilots are being realised in only one city except one, the modern construction site pilot, which is implemented in two cities. None of the pilots is in Nashik. In terms of the number of pilot projects the number for the first phase has been reached but the pilots were not realised in all cities. The second set of pilot projects that would have been based on the updated clean air action plans were not realised. Objectives are thus only partially achieved at this moment.

The pilots have been presented in the cities where they have been implemented. The MRS pilot auditing app has been integrated with 311, an app that is already used by the administration. The imagery from the MRS and hot spot monitoring would be integrated in the Integrated Command and Control Centre (ICCC) for Smart Cities. The model construction site pilot resulted in a guidance report. Assimilation of the report by the authorities will determine the impact of this pilot. The CPCB has requested TERI to present the model construction site pilot in the NCAP regular meeting for all the non-attainment cities.

The actual impact on air quality of the pilot itself is, as to be expected, limited or even non-existent, but the effect of a full scale deployment of the pilot could be assessed with a dispersion model. This quantification of the impact of any of the measures represented by the pilot projects was unfortunately not done.

At this moment the pilots are only operational in the cities where they have been implemented. There is however perspective that they could be implemented in other cities. For the MRS pilot in Lucknow uptake by the administration was seen but for the other pilots it is not clear if this will happen.

There are some links of the pilots to other environmental problems: the electrification of the 2-wheelers will impact their carbon footprint and the pilot in which hots spot such as waste burning are monitored will also address waste management. However, the focus of the project in general is on air pollution, and other environmental issues such as climate change were not considered explicitly.

Some of the activities for the capacity building programs for different stakeholders are still missing:

- Less MRV training programs will be organised (2) than foreseen (8);
- Sector specific training workshops have only been held in Pune and Nashik, none in Lucknow and Kanpur.

Efficiency

As GAINS ASIA already exists, this is a cost effective solution.

The activities on strengthening the action plans and the MRV were done by individual partners and did not require any coordination between partners. The followed strategy to improve air quality plans is in principle efficient. The recommendations based on the SA are based on existing studies or the studies done in this project and although recommendations are not yet based upon full proper use of the methodology (e.g. MCA), results are used cost effectively. By providing specific recommendations on improving air quality plans to the four cities, the local stakeholders receive advice that they can directly incorporate into their CAAP.

Sites and local partners did not benefit from each other's results for the improvements of the CAAP. Cities could benefit from the analysis done for other cities. This could be a workshop in which the project partners present the methodology and the cities present their own air quality plans and how these were or could be improved using the CAP India results followed by a discussion amongst all participants moderated by the project partners.

The MRV guidance developed specifically for Lucknow has been shared with the implementation project partners.

The realisation of the pilots was challenging in terms of project management and coordination between the multiple actors involved. This is also reflected in the delays for this activity. The way the pilots in the end were defined and organised seems somewhat ad-hoc. None of the pilots that are being implemented are specifically mentioned in the Project Document. In the selection of the pilots the monetary cost of upscaling was not considered. If in the end it is not a sound economic plan to upscale the pilot, the investment in the pilot itself is also lost.

The results for the pilots have been presented in the cities where they were implemented. Nashik, where no pilots are currently implemented, is interested in the MRS and model construction site pilots. The process of how to select and set up the pilots will be shared with the relevant stakeholders so that should ensure that these will be able to establish new pilots.

Sustainability

An advantage of GAINS is that a lot of material exists to support users. As GAINS is available as an online tool it does not rely on the installation of software on the hardware of the user. Actual mastering of a tool such as GAINS however requires that people on a regular basis continue to use the tool in practice. Feedback from users indicate that they are bogged down with administrative tasks and will not have time to indulge in using GAINS. Concluding, we wonder if actual use of GAINS by administration personnel will in the end happen and if the

goal should not rather be to familiarize administration with the tool so that they know this exists and what it can be used for.

The studies with recommendations on how to improve the air quality plans based on SA results and MCA were done by local partners and can therefore also be realised in the future. The methodology can also be applied to other cities assuming there is SA data available.

In practice one of the problems reported by TERI was the delay in secondary data collection from various departments, owing to policies, procedures and non-digitized datasets. This same problem will off course also be faced when collecting data for the MRV.

The implementation of all the pilots, except the retro-fit of 2 wheelers, can be replicated in other cities without the replication incurring major costs. The MRS pilot relies on the 311 app that is already used by the administration and the integration in the ICCC will be the same for all Smart Cities. The recommendations resulting from the model construction site pilot can be shared among cities and will be made public when presented to all non-attainment cities at the regular meeting for NCAP. The methodology for setting up pilots has been shared among partners. This should facilitate setting up other pilots in the future.

3.3 Outcome 3: Awareness for clean air action is raised

Introduction

Solving the air pollution challenge will not only require a clear understanding of the problems and imposing the right emission abatement measures but also an effort from the whole population. Support from that population for at times unpopular measures will require that they are aware about the impacts of air pollution and the measures to control the air pollution. In outcome 3 the project aims to raise awareness among school/college students, the general public and the NGO/media through open workshops, campaigns, display boards, print and electronic media, action project activities and training programs.

Achievements

According to the project partners during the project from November 2019 - October 2023 more than 3 million people representing media professionals, public and students have been made aware about the air pollution through multiple awareness programs.

Awareness is raised among school/college students

- 7 workshops and 9 competitions for students from 4 cities for more than 3000 students
- Call for Action Projects have been announced in Lucknow, Kanpur, Pune and Nashik
- A hackathon will be hosted at IITK

General public is sensitized about Air Pollution

There were:

Open workshops:

- 5 public webinars on air pollution and clean air action
- In-person open awareness events organized in Lucknow (6 for more than 5000), Kanpur (5 for more than 3000), Pune (3 for more than 4000)
- One cycling Rally with over 150 cyclists and two street plays in Nashik

Digital displays/posters at major intersections:

Two digital displays: 1 in Kanpur and 1 in Lucknow

Theme-based air pollution awareness videos:

10 short videos on the importance of clean air and the impact of air quality on health were prepared for the 4 cities in 3 different languages.

NGO/Media is sensitized about Air pollution

The following outputs are mentioned in the operational report:

Training program for the Media

- Two media sensitization webinars
- Three in person media sensitization workshop: 1 in Lucknow, 1 in Pune and 1 in Nashik

Media coverage of the training programs and workshops/competitions in the 4 cities

- 140 articles published in local newspapers (readership of 3 million)

Health camps with the help of local medical community

- Two health camps in Pune were organized for General Citizens and Traffic Police (51 participants)
- One Health Camp In Lucknow (52 Participants) and One in Kanpur (71 Participants)

National and international exposure visit trips

Two national and international trips for the city authorities and stakeholders of 1 week for 20 participants from each of the four cities are to be organised. The aim is to make at least 160 people from government and research institutes (from 4 cities) aware of good practices nationally or internationally. This would be assessed using feedback forms.

Relevance/Coherence

Awareness raising activities are certainly relevant as a successful strategy to improve air quality will require broad support from the whole population.

The different targeted groups are a good choice:

- Students represent the future generation and can carry out the message on air pollution and how to improve this;
- As emission sources such as domestic wood burning and traffic involve the general public and air pollution affects public health, awareness raising targeting the general public is relevant;
- A better understanding and awareness of the air quality problem by the media should improve the communication about air quality which will have a positive effect on the awareness of the general public and put the topic on the agenda.

One of the actions for institutional strengthening in NCAP is public awareness and education. The awareness activities of CAP India are thus in line with NCAP.

Effectiveness/impact

Outcome 3 resulted in:

- 7 workshops and 9 competitions for students in 4 cities
- a hackathon that will be hosted at IITK
- 22 open webinars/events
- 2 digital displays/posters
- 10 videos
- A text book for teachers and students on air pollution and a media manual were produced . If we also consider the reports produced for the cities and the other activities and the training manuals, more than 4 blogs/articles and publications were produced for each city.
- media webinars/ workshops
- 140 articles in newspapers
- 4 health camps of which none in Nashik and 2 in Pune
- An exchange visit was conducted at the end of October to China

With reference to the Project Document this means that the following activities are currently still missing or deviate from what was planned:

- 8 action projects for students are missing, action projects have been announced;

- 4 Open Citizen workshops are missing in Nashik and 1 in Pune but there are a few extra ones elsewhere;
- The media workshops, roundtable discussions and interactions (2 in each city) were limited to 2 media sensitization webinars and three in person media sensitization workshops;
- A total of 4 health camps were organised instead of 4 in each city (= 16);
- None of the 4 national trips for City authorities that were planned have been organised;
- One of the 2 international exposure visits have not been organised.

In general the impact of the awareness raising activities was not assessed by the project partners. There is an estimate of the number of people that was reached by the activities but the impressive number of 3 million needs to be tuned down as this is the readership of the local newspapers.

It can be expected that activities that actively involve their target public such as a competition or a hackathon will have more impact than activities that merely expose the public to a message in a newspaper.

Some of the activities such as the cycling rally and street plays in Nashik are existing activities that were dedicated to air pollution for the occasion. As these are recurring events that are familiar to the public it is to be expected that these will have an impact.

For the awareness raising activities among students in Nashik there was a pre-assessment report for schools in Nashik to determine a baseline for a comparative post-project and impact analysis study on project-closure. In general there was however no such pre/post assessment for all activities so that impact can't objectively be assessed.

Some of the awareness activities were organised as part of existing activities such as waste management and tree plantation and in that sense also addressed other environmental challenges. The synergies with the other environmental problems were in that sense a means of organising these activities.

Efficiency

The awareness raising seems to be well managed. There was from the onset of the project a clear idea of what needed to be done and this is now, albeit with some delay, systematically been realised by TERI and the local TERI coordinators in the four cities so that by the end of the project all awareness raising activities are expected to be finalised. The cost-benefit of the awareness raising activities could not be assessed as the benefit could not be quantified (see impact).

Impact

In general the impact of the awareness raising activities was not assessed by the project partners. There is an estimate of the number of people that was reached by the activities but the impressive number of 3 million needs to be tuned down as this is the readership of the local newspapers.

It can be expected that activities that actively involve their target public such as a competition or a hackathon will have more impact than activities that merely expose the public to a message in a newspaper.

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Some of the awareness activities were organised as part of existing activities such as waste management and tree plantation and in that sense also addressed other environmental challenges. The synergies with the other environmental problems were in that sense a means of organising these activities.

Sustainability

The outreach of the awareness activities exceeds the critical mass defined as more than 2 million.

The experience with organising these awareness activities has been shared amongst the project partners.

Except for the awareness activities that were grafted on local activities such as the cycle rally in Nashik, all the listed activities could be replicated to other cities.
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4 RECOMMENDATIONS FOR THE REMAINING PERIOD OF THE PROJECT

This section lists remaining points for finalizing the outcomes and recommends activities that would enhance the fulfilment of the objectives.

4.1 General

1. There is a need for consolidation of what was done in this first phase. This should result in a final report from the project that details:
    a. Both methods and experiences from outcome 1 and 2 that are needed to establish and improve the clean air action plans methodology.
    b. With respect to the awareness raising and capacity building activities what worked and what didn't work and why this was the case.
2. There is a significant difference in outputs across the four cities. It is important to share the outputs and learnings across cities. It would be useful to organize workshops in Lucknow and Pune and invite the stakeholders from the other two cities to share the additional work done in these two cities and deliberate on the learnings and reasons for success and failure.
3. On boarding of the CPCB and the respective SPCBs needs more attention. There is a large difference in capacities across the regulatory body and it is critical to share the outputs at relevant levels of PCBs. The implementation partner, TERI, needs to organise more interactions with SPCBs to ensure that the outputs are not only understood by relevant officials but also taken on board.
4. The project partners should prepare a plan to complete all uncomplete deliverables:

1. the dispersion modelling for the 4 cities;
2. the pilot(s) that are being implemented for the city;
3. the classic and advanced SA analysis.
4. provide the training courses for capacity building for data measurement and analysis on clean air that are currently still missing and target the right audience for these trainings (young potentials).
5. Make a plan for organising the awareness activities that are still missing and organise these.

4.2 Outcome 1 Improved data measurement and analysis on clean air policies and action plans

5. major research outputs specifically related to real time advanced SA should be effectively communicated to partner institutions other than IITK and to stakeholders that have not been addressed until now by organising a workshop where the benefits of advanced SA for NCAP and air quality management in general are outlined in 'layman' terms. The outputs of advanced SA also are yet to find their way to the stakeholder especially the PCBs. The workshop could also assess the use of advanced SA in other cities, in terms of cost and capacities/capabilities. This could result in a technical policy note to discuss a more generalised use of advanced SA.

6. Assure that the guidance documents on monitoring and monitoring networks are adopted by PRANA.

4.3 Outcome 2 Enhanced capacities of city and state authorities to implement clean air plans

7. Finalise and present the document with the recommendations on how to improve the action plans for Lucknow. For all cities follow up on actual uptake of the recommendations on how to improve their action plans.
8. Ensure uptake of the MRV and the methodology for strengthening CAAP using MCA in the PRANA portal.
9. Finalize the pilot projects and assure their results are documented and disseminated. The MRS and hot spot monitoring need at least an implementation path for integration in the existing 311 app and the ICCC. The model construction site guidelines need to be presented at the general meeting for the non-attainment cities.

Less important (as there is probably not enough time):

10. Quantify the monetary costs of upscaling the pilots and impact on the air quality.

6 INPUTS FROM STAKEHOLDERS FOR THE NEXT PHASE

6.1 Outcome 1 Improved data measurement and analysis on clean air

Emission inventories: Supposing in the next phase the area of interest is expanded to an airshed, expanding the emission inventory to rural areas will require appropriate emission factors and activity estimates for those rural areas and monitoring for these areas to validate the air quality models. In the same line stakeholders would like to see EI for additional areas. MPCB mentioned including cities like Aurangabad where there is more industry. If the area of interest is extended to an airshed, any NAC within the airshed will automatically also need to be considered. To ensure the EI for the airshed is also useful for the NAC and NCAP. The EI resolution could be higher as required by NCAP in the NAC areas and lower outside the NAC. If an airshed is considered, also other emission source categories such as agricultural sources will need to be included. Natural sources could also be considered. While these can't be addressed using abatement measures, insight on their contribution provides the limits for the improvement that can be expected from policy measures. Also pollutants such as VOCs could be added to the EI. If the area of interest is extended beyond the cities, the modelling would also need to consider a larger area. If one in the next phase go to the airshed approach, which is recommended by the evaluation team, the World Bank India should be consulted to bring their experience and results on board. .

Advanced SA is a valuable method to gain insight into the sources and processes underlying AQ problems with PM. It is however a very resource craving methodology that would simply be impossible to scale up to many cities. When questioned on how the methodology could be used in the future the following was proposed:

- The World Bank envisioned a cheaper but still accurate methodology that would still provide more insight than the current classical SA based on the experience with the current advanced SA methodology;
- IITK proposed to combine the results of the advanced SA with measurements from cheap sensors using deep learning techniques. While this does seem promising half the evaluation team is rather sceptical about using inexpensive sensor data;
- PSI was interested in deriving a spatial pattern and suggested mounting the advanced SA equipment on a mobile platform. Such a mobile measurement setup is already being used by IITK.

For the advanced SA, the knowledge transfer/coordination regarding online-offline measurements and hybrid receptor-oriented source apportionment from PSI to IITK is clear from the many joint publications from the team. However, more workshops could be conducted with other relevant stake holders such as TERI, NEERI, ARAI and CPCB in the country as the know how is now very much concentrated at IITK. The advanced SA activity results could also contribute to the improvement of the monitoring networks and for validation of the CAAQMS results.

Concerning the source apportionment in a second phase:

- Most of the stake holders, for example the Municipal corporations in Pune and Nashik and the Secretary for Environment in Lucknow have shown strong interest to carry out more advanced SA studies in future. Furthermore, there are programs planned to establish supersites in Lucknow and carry out similar analysis. These supersites would include real time PM components and gases measurement, which would facilitate real time source apportionment.

- Some stakeholders, for example Municipal corporation in Pune and UNEP, voiced interest in carrying more studies on secondary pollutants such as ozone in the second phase and provide action plans to reduce ozone concentrations in regions.

Airshed approach: If the area of interest is extended to an airshed (of appropriate size) so that not only the city is considered but also the surrounding rural/village areas, the criteria for station location and monitoring network topology will need to be revised. The know-how for this activity is available with EPFL that was involved as an implementation partner to analyse the existing monitoring network and provide specific recommendations to improve the monitoring networks in each city.

Capacity building: Mr. Tiwari (UPPCB) stressed capacity building should continue and should best be focused on young, high potential individuals instead of involving all personnel. Regional knowledge centres should be promoted. Now there is only IITK. The capacities in local universities should be increased so they are also capable of contributing to AQ issues. Capacity building in this case is not about infrastructure, but knowledge transfer.

6.2 Outcome 2 Enhanced capacities of city and state authorities to implement clean air policies and action plans

The Swiss partners were not involved in this activity in the first phase of the project but could contribute to improving the analysis for selecting the preferred set of abatement measures which is currently based on MCA.

Another option, proposed by TERI, would be the provision of information on novel control/ emission abatement technologies for different sectors that could be useful for defining pilots in a next phase.

With respect to improving CAAP and the MRV there were no explicit expectations from the stakeholders. If the GAINS course is organized again it should be longer. Maybe an idea would be to organize two courses: one for those that are not familiar with a tool such as GAINS and that focuses on the principles and what kind of useful information the tool can provide , and another one that is intended to teach actual use of GAINS. For the pilots some cities mentioned they would be interested in some of the pilots that have already been implemented in phase 1. For example Nashik mentioned interest in the MRS audit pilot. Mr. Tiwari (UPPCB) suggested to provide support to industry and for better technology solutions.

6.3 Outcome 3 Awareness for clean air action is raised

The MPCB in Nashik proposes to mainly target children and women through schools and a program for households. They also wondered how awareness could be monitored. The latter is missing currently making it difficult if not impossible to assess whether the awareness campaigns have been successful. Awareness raising is also a slow process and some of the activities will need to be repeated to result in a lasting change in behaviour

7 RECOMMENDATIONS FOR THE NEXT PHASE

Organisational

1. A more structured arrangement and stronger connect and communication to regulatory agencies and with federal government and on boarding of private sector players. This should be through formal Memoranda of Understanding (MoUs) with mechanisms for cooperation such as setting up of an Apex Advisory Committee comprising project partners, representative from MoEF&CC, CPCB, IIT-M, CDAC, academia, etc. The role of the committee should be to guide the process of selection of state/sites/cities and facilitate networking at the implementation level. The intention is not to overburden the project with meetings and paperwork but to ensure buy in of all relevant authorities formalized on paper and to optimise involvement of all stakeholders. Meetings should therefore be kept to a minimum: twice a year should be sufficient to keep everyone informed;
2. A structure with a single responsible partner would be preferable instead of the current project structure without an overarching responsible for both the research and implementation component;
3. Systematic and repeated follow up of recommendations and reports to the authorities seems essential for uptake. An implementation committee would be useful at the state level with representatives of state and city authorities that work collectively with implementation partners;
4. It may be useful to have tripartite MoUs in place between government, private sector and a financial institution for the implementation of the pilots. This is again to ensure all relevant parties are on board and are committed;
5. Important is also a greater outreach connect to international agencies such as UNEP which is already actively pursuing a national platform for stakeholder connect and engagement. Similarly, it may be useful to connect UN Habitat to synergise with their urban initiatives. More understanding with such institutions at the inception state of the project would be very useful.

Geographic focus

6. Focus should shift from the city scale to airshed scale to better account for the significant contribution of sources outside the city/district. This would ensure a connect to initiatives from international agencies such as World Bank and United Nations Environment Program. It could therefore be useful to sign a separate MoU with the World Bank for leveraging and synergising with their initiatives. The shift of focus does not imply that CAP India should now try to address all air quality problems for a whole air shed but rather that when addressing the air quality in a city the contribution from emitting sources outside the city and the district should be considered. The quantification of that contribution could be from other projects such as the World Bank project for the IGP ;
7. The state(s) need(s) to be selected in close consultation with MoEF&CC, CPCB and World Bank to focus more effectively on integrating with IGP focused initiatives of NCAP and World Bank. The state should also be chosen based on willingness to finance and implement some pre-discussed pilots. Next phase may consider specifically focussing on IGP and retain the state of Uttar Pradesh where the authorities are keen and have a clear pathway to synergise CAP with NCAP. It would be useful to add one more state such as Punjab or Haryana. Of course, as indicated the final selection should be in close consultation with federal authorities. Another option could be to either go with Maharashtra or any other non IGP state

to have a more comprehensive approach for air quality management. If continuing with Maharashtra and UP the next phase could build incrementally on the Phase 1 results.

Outcomes

8. The activities in phase 1 could all be considered for the second phase however they should be organised as to best contribute to the improvement of the clean air action plans.

Specific recommendations for the outcomes are:

Better understanding of the air pollution problem

9. Considering an airshed approach, will require inputs on background air quality considering all the available CAAQMS, also those managed by industry, as well as the sensor networks in the air shed. Also, emission inventory (EI) and dispersion modelling activities will need to be expanded to the larger airshed area;
10. The advanced source apportionment (SA) activities should fit in with the air quality modelling, classical SA and improvements to CAAP using SA data. An idea would be to develop a downscaled, less expensive version of advanced SA that is still robust and sufficiently accurate but that could be deployed at more locations. Such an activity, should be extensively and critically discussed in advance with input from all experts on the topic before actually being pursued;
11. Validated air quality models should be used to quantify the effects of CAAP and proposed pilots so that the air quality improvements that can be expected from these CAAP and the pilots can be presented and discussed with stakeholders;
12. To further raise confidence in the different project results the project needs to adopt a systematic validation and/or verification methodology. New EIs should be compared to existing EIs, dispersion model results should be compared to observed concentrations and results from dispersion model and receptor model-based SA should be compared;
13. To connect to climate change consider quick wins such as using GHG emission factors to calculate GHG emissions on top of air pollutant emissions.

Implementation of CAAP

14. The pilots need to have clear synergies with clean air action plans (CAAP) and up front financial and organisational support;
15. Pilots in themselves (probably) have a limited impact on air quality but should demonstrate potential for upscaling;
16. When considering the air shed, pilots could target emission sources outside the city such as from agriculture or larger industrial facilities and could be an opportunity to test novel technological measures. It is also where CAP India could be complementary to the World Bank IGP project where the application side is missing;
17. The selection of pilots should be accompanied by a quantification of the monetary costs incurred with upscaling and the expected air quality improvement;
18. Uptake should also target standard, existing platforms that are commonly used such as PRANA and/or fit in with Smart City initiatives.

Capacity building and awareness programs

19. Pollution impacts every citizen and it is important to take them on board both for monitoring and the mitigation effort (citizen science). Further it is important to on-board the youth, students and citizens at large by demystifying scientific and technical outputs by communicating the results in simple easy to relate terms;
20. The capacity building and outreach element of the next phase needs to be stronger with more intensive training program and workshops involving government agencies and private sector. It would be useful to collaborate with institutions such as IITs to offer technical training programs and workshops.
21. A proposal can be on building a cadre of trainers (train the trainer) who can carry forward the capacity building and outreach agenda through structured offline and online modules and programs. Alternatively or simultaneously, an effort can be on setting up a knowledge platform where different knowledge institutions can share their outputs.
22. Capacity is also currently too much concentrated in the IITs and should also be built at local universities and directed towards high potential candidates and/or courses need to be tailored to the background of the trainees.
23. The effectiveness of training and awareness raising programs should to the extent possible be assessed by pre- and post-polling of the target group.
24. One of the problems faced is the high turnover in personnel whereby people leave before the training starts to pay off. The prospect of constantly being able to develop one's skills through training could also attract people to the job and help keep them there.
25. More intensive exchange programs need to be put in place for shorter or longer periods of time (secondment). Such programs can be at two levels: one, at the national level and second, at international level to countries having a good track record in coping with air quality problems.

8 ANNEXES

ANNEX 1: QUESTIONS FOR THE EVALUATION

The complete set of questions is presented in **Error! Reference source not found.** to **Error! Reference source not found.** below. The set of questions highlighted in green in these tables, are those SDC explicitly requested to be answered.

Table 4: List of questions on Relevance and Coherence (green are SDC questions)

#	Question	Literature/Data sources/Method	How to measure
A.1	How relevant is the CAP India contribution (in terms of actual Outcomes/Outputs) to the India's National Clean Air Program (NCAP) goals and objectives? How does the project support India and each of the project partner cities in meeting their NCAP objectives? To what extent does the project (not) help the beneficiaries meet the relevant actions and targets set by the NCAP?	• Project reports • NCAP_Report.pdf (moef.gov.in) • State of the art & outlook for NCAP clean air action plans such as, https://doi.org/10.1016/j.aeaoa.2020.100096 • Interview key local stakeholders in each city (state and local PCB's; key city secretary; key knowledge institutions…) • World Bank Project (brief interview with IIASA) • UNEP (brief interview with Dr. Sumit Sharma) • CCAC & USAID projects • EU-India Partnership on Air Quality Management	List of project achievements (objectives) that address the relevant NCAP action points (e.g. EI/awareness campaign..) and targets, and briefly how they do this per subprojects/site measured against the baseline (before project) List of relevant international initiatives to which the project aligns, and a brief description of the key synergies, potential for further cooperation and improvement and where there is overlap
A.2	Is CAP India contributing or complementary to other interventions such as the Clean Air Initiative by the World Bank, United Nations Environment Program (UNEP), Climate and Clean Air Coalition (CCAC) and other organisations?	Relevant local projects identified by the national expert of the evaluation team and requested from the local stakeholders via the CAP India project team	List of key AQ management policies/objectives of the city, and any relevant studies to which the project aligns and/or is complementary, highlighting key synergies, overlaps & potential for further cooperation and improvement.

Table 5: List of questions on Effectiveness and Impact (SDC questions)

#	Question	Literature/Data sources/Method	How to measure
B.1	Are the objectives of both components (research and implementation) being achieved and are the recommendations made effective for air quality improvement? Is the project on track to reach its objectives?	• Project documents: contract/proposal, log frame, project progress reports, deliverables, meeting notes • Site visits: presentations from and interviews with the project team and local stakeholders	Compare progress to date (results/deliverables) achieved against the objectives; note successes, shortcomings and lessons learned.
B.2	Have the city and state government authorities and research institutions benefitted from various capacity building programs? How has the scientific know-how and capacity of the local stakeholders been sufficiently strengthened by the various capacity building programs? Also is the project effectively managed to bring the adequate impact on different stakeholders?	• The project reports. • Site visits and interviews with the local project team and local stakeholders (both direct and indirect) to assess to what extent they have benefitted from the capacity building programs and have been impacted by the project.	Number of stakeholders that 1) received training and that 2) demonstrate they actually master the newly acquired skills Overview of the key challenges & lessons learnt for further uptake by the authorities and institutions
B.3	How effective are the pilot demonstration projects and do they show a quantifiable impact as well as the potential for scaling up? Are they tackling the 'highest' polluters as shown by the project's scientific data? Could they be scaled up? What resources would be required? What pilot projects would be promising for a potential phase 2 project?	Assessment of the pilot deliverables/results/progress and the resources needed for scaling up, interaction with project partners where further clarification is needed	Pilot demonstration project: • Improvements to AQ? • tackles the key sources (yes/no). • is scalable (yes/no)? • Will/does the project describe how it could be scalable? • Lessons learnt for a follow-up Phase 2
B.4	Have synergies between air pollution and other environmental challenges such as GHG emission and climate change been exploited, and with what impacts?	The project reports, looking at both the measures proposed and the capacity building aspects (awareness)	Synergies with climate change or other environmental issues were addressed (yes/no)? Which ones? Opportunities that are not addressed that we see will be suggested.
B.5.a B.5.b	Was the project able to contribute to policy (initiatives/schemes/program) processes at national and state/city level? Also, specify the impact of the Swiss technical know-how transfer under both the project components (research and implementation)	Reports & interaction with stakeholders	Impact of the project on policy processes at the different levels both due to the implementation and the research component Was there specific Swiss knowledge transfer (yes/no and how)?

Error! Reference source not found. *continued: List of questions on Effectiveness and Impact (additional questions)*

#	Question	Literature/Data sources/Method	How to measure
B.6	What new air quality data has been produced or collected and how is it being utilised by the stakeholders? Does this data respond to the data needed by the site in terms of improved basis for action plan development? Are all relevant pollutants considered, is the data accurate and complete?	• Review of the new data streams (EI, AQ monitoring and modelling data incl source apportionment…) • Site visits: presentations from and interviews with the project team and local stakeholders	Overview of the new data sets, their fit for purpose, gaps (challenges) and uptake
B.7	Is the MRV framework that was developed capable of assessing the effectiveness of the city action plans	Expert judgement based on analysis of the MRV framework details.	Feedback score on using the MRV from local stakeholders
B.8	Air pollution is a transboundary and trans-sectoral issue. Furthermore, there are synergies to be made with climate change and GHG. Has the project brought sectors and adjoining cities/states together to tackle these issues? To what extent has the project considered the most relevant sectors? If not why is this the case? Are these already targeted in other initiatives? not part of the objectives?	Screening of the decision process adopted in setting the project objectives through interaction with SDC, project partners and assessment of project deliverables, esp. the contribution to air quality plans and the pilots. Consider relevant metrics and/or awareness activity report if available. Awareness activity attendance records and feedback forms.	The project considers transboundary/sectoral as well as GHG issues (yes/no) and possible improvements in this respect Number of events, attendees, size targeted audience, attendee feedback scores. Which KPIs does the project consider in this respect if any?
B.9	How effective have the awareness activities been? How is this effectiveness measured?		
B.10	In your opinion what are the project's 'key achievements and lessons learned'? What would you do differently?	Interview of key local project partners & stakeholders	Consolidated list of key achievements and lessons learned.

Table 6: *List of questions on Efficiency of the project management and strategy (green are SDC questions)*

#	Question	Literature/Data sources/Method	How to measure
C.1	Is the overall management of the project components (also between consortium members) efficient and well-coordinated? How well does the consortium work together? How are issues and deviations handled?	• Project docs: achievements, timeliness and quality of outputs. Records of regular consortium progress meetings, meeting minutes, management and QC procedures. • Cross-cutting activities: to what extend the different partners are aware and (re) use results from other partners in the project. How do the pieces fit together? • Interview/feedback questionnaires from project staff	• Records of documented meetings within subprojects and between partners • Handling of any issues/deviations
C.2	Have funds allocated for CAP India been utilized efficiently (cost effectiveness)? How do the financial resources used match the technical and capacity building outcomes and original budgets?	• Review of the budget and financial statements • Review of the project outputs • Interviews with the relevant project staff and stakeholders	(Sub) Project is within budget or not If not, why? Check whether and why there are large parts of the budget not used (yet).
C.3	How relevant are the strategy and approach followed under the two project components (research and implementation)? How do they address the project's strategic aim to improve air quality?	• Project documents. • Discussions with the relevant project staff and stakeholders	The deliverables of the research and implementation components serve their aims; The research and implementation parts intertwine and are complementary
C.4	Have feedbacks given by stakeholders during capacity building programs and workshops been appraised and integrated into following activities?	Interaction with project partners and stakeholders to elicit to what extent there was (possibility for) feedback, how this feedback was then recorded and used in the project	Extent to which there was feedback and this was incorporated in the project
C.5	Have the city/state/central government endorsed/adopted the outcomes and recommendations of CAP India in their reports, official circulars and plans? If not, why not?	Interaction with the project partners and local stakeholders to determine if the project and its results were endorsed National expert to provide their assessment herein	• Local strategic plans, reports, communications rely on project results • Relevant meetings between the project partners and the local stakeholders regarding, or by the local stakeholders themselves.
C.6	Do the sites and/or the local project partners benefit from each other's results?	Assessment of the cooperation between project partners both from the deliverables and interviews with the partners	Examples where partners benefit from each other's results

Table 7: *List of questions on Sustainability of the project management and strategy (green are SDC questions)*

#	Question	Literature/Data sources/Method	How to measure
D.1	Are the current strategy and partnerships sufficient to guarantee the sustainability of results? Are results achieved under the project sustainable? Is there a task within the project to demonstrate the continuity of the relevant project results with the local stakeholders? • How will they become anchored within the daily operations of the local stakeholders? How will they be used/updated? • What (technical) challenges/ do they face? • How robust, reliable and useful are the technical solution e.g. is the MRV/EI/SA, fit for purpose or too complex, too technical? • Other barriers – e.g. financial? • Are there sufficient resources and know-how	• Interaction with the project partners and local stakeholders to determine the uptake and further uptake potential/challenges re. technical know-how, resources (IT, personnel & budget). • Expert opinion from National expert. • Interviews with project partners and stakeholders focusing on project objectives and results adoption and acceptance	• Existence of a continuity / post project/ sustainability plan. • Documented/demonstrative uptake of the products by local partners and stakeholders
D.2	Have the awareness activities conducted reached the critical mass (media professionals, general public and students)?	Discussions with the relevant stakeholders	Outreach of the awareness activities
D.3	Do the results achieved have the potential to be replicated in other Indian cities and in other areas apart from air pollution, such as climate change mitigation? Can any elements of the project be exploited elsewhere for other project themes?	• Project documents Discussions with the relevant project staff and stakeholders, and SDC	List of exploitable elements from which others could benefit
D.4	What would be the Swiss added value in the next phase of the CAP India project?	• Project reports with focus on Swiss contribution and results in current phase • Discussions with the relevant project staff, stakeholders, and SDC	Recommendations for Swiss contribution in next phase.
D.5	What are the expectations for the Potential Phase Project 2? Technically, implementation wise and financially?	• Project documents. • Discussions with the relevant project staff and stakeholders, and SDC.	Documentation or transcriptions from interviews on the plans for the next Phase of the project.

ANNEX 2: DOCUMENTS PROVIDED BY SDC/TERI/PSI

SDC_310723
- SDC Credit Proposal
  - 190315_CAP_India_Change Duration Entry Phase.pdf
  - CAP India Credit proposal signed.pdf
- Contracts
  - PSI research
    - 7F-10093.01.04 Contribution 81062452 PSI Paul Scherrer Institut PSI Villigen Research Clean Air Project CAP India.pdf
    - Revised Budget PSI CAP India November 2021.pdf
    - Subcontract PSI-IIT Kanpur.pdf
    - Subcontract PSI-Uni Bern.pdf
- Financial reports
  - PSI
    - PSI_04-2021_09-2021.pdf
    - PSI_04-2022_09-2022.pdf
    - PSI_10-2020_03-2021.pdf
    - PSI_10-2021_03-2022.pdf
    - PSI_10-2022_03-2023.pdf
    - PSI_11-2019_09-2020.pdf

TERI
- Prodoc
  - ProDoc_18.10. 2019(final)-clean.pdf
- Contracts
  - TERI Implementation
    - TERI_SDC main Contract Amendment.pdf
    - TERI_SDC_main_Contract.pdf
    - TERI_partners agreements
      - EPFL_TERI Consortium agreement.pdf
      - IIASA_TERI Consortium Agreement.pdf
      - IITK_TERI Consortium Agreement.pdf
      - TERI_ARAI Consortium Agreement.pdf
      - TERI_NEERI Project Specific Agreement.pdf
- Govt support letters
  - Consent letter from Maharashtra.pdf
  - MoU TERI_UPPCB_Lucknow Nagar_Nigam.pdf
  - Support letter of MPCB and UPPCB to CAP India Project.pdf
- Operational (common TERI+PSI) reports
  - 1 st Operational Report (Nov 2019 - Apr 2020)
    - 1 st operational report (Nov 2019 - Apr 2020).pdf
  - 2 nd Operational Report (Nov 2019 - Sep 2020)
    - 2nd Operational Report (Nov 2019 - Sep 2020).pdf
    - Annex to 2nd Operational Report (Nov 2019 - Sep 2020).pdf
  - 3 rd Operational Report (Oct 2020 - Mar 2021)
    - 3rd Operational Report (Oct 2020 - Mar 2021).pdf
    - Annex to 3rd Operational Report (Oct 2020 - Mar 2021).pdf
  - 4 th Operational Report (Oct 2020 - Sep 2021)
    - 4th Operational Report (Oct 2020 - Sep 2021).pdf

Annex to 4th Operational Report (Oct 2020 - Sep 2021).pdf
5 th Operational Report (Oct 2021 - Mar 2022)
5th Operational Report (Oct 2021-March 2022).pdf
Annex to 5th Operational Report (Oct 2021-March 2022).pdf
6 th Operational Report (Oct 2021 to Sep 2022)
6th Operational Report (Oct 2021 to Sep 2022).pdf
Annex to 6th Operational Report (Oct 2021 to Sep 2022).pdf
7 th Operational Report (Oct 2022 - Mar 2023)
7th Operational Report (Oct 2022 - Mar 2023).pdf
Annex to 7th Operational Report (Oct 2022 - Mar 2023).pdf
Financial reports
TERI
1 st financial report (Nov 2019 - Apr 2020).pdf
2 nd financial report (Nov 2019 - Sep 2020).pdf
3 rd financial report (Oct 2020 - Mar 2021).pdf
4th financial report (Oct 2020 - Sep 2021).pdf
5th Financial Report (Oct 2021 - Mar 2022).pdf
6th Financial Report (Oct 2021 - Sep 2022).pdf
7th financial report (Oct 2022 - Mar 2023).pdf

Knowledge products and events
Awareness events
1st year (Nov 2019 - Sep 2020)
Agenda of webinar Series on air quality management from 23rd April to 1st May 2020.pdf
Project launch in Kanpur - 28 Aug 2020.pdf
Project Launch in Lucknow_5 August 2020.pdf
Project launch in Pune - 2 Sept 2020.pdf
Workshop to strengthen `Clean air action plan of Lucknow.pdf
2nd Year (Oct 2020 - Sep 2021)
Agenda for Workshop on SoFI program.pdf
Air Pollution Health Web webinar (1200x 630)_2020.jpg
Background Note& Agenda- Health (Pune and Nashik)_final.pdf
Background Note- WED Event_04.06.2021.pdf
Source apportionment training program_17th-19th March 2021 (1).pdf
Urban AQ management training_24th-25th March 2021.pdf
Webinar Agenda_4th June.pdf
WSDS Thematic track 2021.pdf
3rd Year (Oct 2021 - Sep 2022)
[Awareness_school] -> Background note- 28th Oct 2021.pdf Edited_Banner-28 Oct.jpg
[Kanpur]
[community awareness event]
Living with Harmony with Nature 3 July Kanpur.jpg
[Event Pictures]
DSC_0470.JPG DSC_0510.JPG DSC_0595.JPG
DSC_0605.JPG DSC_0628.JPG
[Digital Board Kanpur]
DDB_Kanpur.jpg DDB_KNP.jpg

[Lucknow]
Lucknow Activities.pdf

[EI and disp modelling training]
Agenda of training program 29.04.2022 (1).pdf
Emission Inventory and disperssion modelling Training.jpg
[Final Training Material]
Compiled Training Material TERI.pdf
EI ppt.pdf
EI Transport Sector sheet 1.pdf
EI Transport Sector sheet 2.pdf
[Media workshop on Blue Sky Day]
Background Note & Agenda.pdf
Media Publications.xlsx
Media Worshop MoM.pdf
[Media coverage]
Desh Pratidin Media Report.pdf
Media Program.jpeg
WhatsApp Image 2022-09-08 at 11.59.29 AM.jpeg
WhatsApp Image 2022-09-08 at 11.59.42 AM.jpeg
[Samanvay Public Awarness Lucknow]
Flyer_Cinepolis.jpg
Flyer_Wave Mall.jpg
Signature Pledge Board.jpeg
[Event pictures]
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[Nashik]
[Awareness event]
Capacity Building Workshops for School students.pdf
Handbook realeased on Mitigating childrens exposure to traffic pollution in Marathi.pdf
[Workshop on Clean Tech Opts for Indus]
[Pune]
Agenda of 1st Training Workshop on Clean Technology Options for Industries.pdf
IMG_20220920_180847.jpg
IMG_20220920_180913.jpg
IMG_20220920_180926.jpg
[Health Camps]
Flyer for health camp.pdf
Health Camp_Details.pdf
[Public Awareness Event (Samanwaya)]
Activity Details.pdf
Concept Note of the Event.pdf
[Sector Specific Training Program]
Agenda of 1st Training Workshop on Zero Emissions and Clean Technology Feasibility.pdf

Agenda of 2nd Training Workshop on Zero Emissions and Clean Technology Feasibility.pdf

[Pics of the event]

1st- a .jpg 1st- b.jpg 1st- c.jpg
1st- e.jpg 2nd- a.jpg 2nd- b.jpg 2nd- c.jpg 2nd- d.jpg
2nd- e.jpg 2nd- f.jpg 7X1A7840.JPG 7X1A7848.JPG 7X1A7851.JPG
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[Two-Day Capacity Building Program on GAINS Model]

Agenda of Two-Day Capacity Building Program on GAINS Model.pdf
Proceedings report on GAINS workshop.pdf

4th Year (Oct 2022 - Mar 2023)

[Kanpur]

[Event 1]

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[Lucknow]

[GAINS model training Program]

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GAINS Lucknow flyer (2).pdf Gains Train.JPG
Gains Training.JPG List of Participants.xlsx

[MRS Training Program]

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IMG-2438.jpg IMG-2468.jpg
IMG-2496.jpg MRS training Agenda11-1.pdf

[Nashik]

[2nd Industry Specific Workshop 7_2_23]

Agenda.jpeg
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WhatsApp Image 2023-03-02 at 10.57.24 AM.jpeg
WhatsApp Image 2023-03-02 at 10.57.26 AM.jpeg

[Media Workshop 18_01_23]

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2d. Sakal (1).jpeg

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4. MT (1).jpeg
5.DM (1).jpeg
6. DD (1).jpeg
7. LS (1).jpeg
8. PD (1).jpeg
Agenda for Media Workshop at Nashik 180123 (1).docx
Draft Press release_Nashik-2.docx
DSC01596.JPG
EI Report Summary English.docx
EI Report Summary Marathi.docx
Participants List_Media_Workshop.xlsx
Press Release Marathi updated.docx
Questionnaire Updated.docx

[Samanwaya_Citizen Awareness 21_1_23]

.DS_Store
Agenda_Samanwaya.docx
Banner Samanwaya.jpg
Draft Press release_Samanway Nashik.docx

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Newspaper_1.jpeg
Pledge Board .jpg
Press Release Marathi updated.docx
Program Details.docx
Selfie Standee.jpg
Suvichar.jpg

CAP India Files TERI_310723\7 Knowledge products and events\Awareness videos created under the project

Avoid Overloading of vehicles.mp4
Dance perfomance and pledge.mp4
DUSTCTR.mp4
Nukkad natak.mp4
SAVEFUEL.mp4
TERI - Save Fuel English.mp4
TERI - Save Fuel Hindi.mp4
Teri - Say No to Open Burning English.mp4

Teri - Say No to Open Burning Hindi.mp4
TERI CAP India Project - Maintain Your Vehicle English.mp4
TERI CAP India Project - Maintain Your Vehicle Hindi.mp4
Tree Plantation.mp4

ANNEX 3: INTERACTIONS WITH STAKEHOLDERS IN INDIA

Date	City	Officials	Organisation
3-Oct	Delhi	Dr. Jostein Nygard	World Bank
3-Oct	Delhi	Dr. Valentin Folestcu	UNEP
3-Oct	Delhi	Dr. Anju Goel	TERI
5-Oct	Delhi	Shri Ravindra Kumar Tiwari	MoEF&CC
13-Oct	Delhi	N Subhramanyan	MoEF&CC
4-Oct	Pune	Mr. Kunal Khemnar, Mr. Mangesh Dighe	PMC
		Mr. Chetan Sangole	MCCIA
		Mr. Shankar Waghmare	MPCB
5-Oct	Nashik	Mr. Vijaykumar Munde	NMC
		Dr. Rajendra Rajput, Mr. Amar Durgule	MPCB
9-Oct	Pune & Nashik	Mr. Avinash Dhakane	MPCB
9-Oct	Kanpur	Prof. Mukesh Sharma, Dr. Pavan K Nagar, Dr. Dhirendra Singh	IITK
		Dr. S.N. Tripathi, Dr. Sameer Singh, Dr. Amit Yadav, Dr. Trailokya Saud, Ashutosh Shukla, Akanksha, Vaishali Jain	IITK
10-Oct	Lucknow	Shri Ashish Tiwari, Mr D K Soni, Mr Sanjeev Pradhan, Ms. Divya Singh, Mr Deepak Yadav, Mr Navneet Chaudhary, Mr Pradish Acharya, Mr Vinay Singh, Mrs Sweta Kumari, Dr Ram Karan Singh, Mr J P Maurya, Mrs Anshika Yadav, Mr Aditya Singh	DoE, CPCB, LMC, PMU, SBM-U, DoULB's, Civic Solution Pvt, Ltd, APAG, UPPCB

ANNEX 4: ASSESSMENT GRID FOR PROJECT EVALUATIONS OF THE SDC INTERVENTIONS (october 2023)

This assessment grid is a mandatory annex to external evaluations (and internal assessments in the case of SECO) of SDC and SECO financed projects and programs (hereinafter referred to as an 'intervention'), be they commissioned by SDC, SECO or external partners. It is based on the OECD Development Assistance Committee evaluation criteria and guidance.[3] Its purpose it to help make results of evaluations more transparent and quantify them (transform the qualitative information in the evaluation reports into quantitative scores) in a standardized manner. This serves accountability purposes and helps for the aggregate reporting, steering and learning.

How to use this assessment grid:

- Evaluators should provide the filled assessment grid in ***Word***.
- All *applicable* sub-criteria should be scored and a short explanation provided. If the evaluation ToRs explicitly exclude some DAC criteria, they should not be filled in the assessment grid. To guarantee coherence, it is advised to match each evaluation question in the ToRs to a sub-criterion in the assessment grid.
- The 20 sub-criteria shall not be modified, however additional sub-criteria may be added to reflect specific objectives and learning interests of the commissioner.
- If specific results are not yet measurable at the time of the assessment, it requires analysing the likelihood of achieving those results (in particular for the criteria effectiveness, impact and sustainability). Please mention this in the dedicated section (evaluability assessment on p. 2).
- There are hyperlinks on each evaluation criterion in the assessment grid, which lead to the OECD guidance on each specific criterion. The guidance also includes information on the interlinkages and differences between the DAC criteria.
- When applying a gender and climate lens, evaluators are expected to use the relevant guidance.[4]
- To rate each sub-criterion, select your rating (0-4, kindly only use integers) in the column “score”:

	Relevance / coherence / efficiency	Effectiveness	Impact	Sustainability
1= Highly satisfactory	There were **no shortcomings** in relation to the intervention’s relevance/ coherence/ efficiency.	Objectives at outcome level were (or are likely to be) **fully** achieved or exceeded.	The intervention had (or is likely to have) a **significant positive** impact.	**All** of the intervention’s benefits (will) last. *Note: for this rating, clear evidence is required (not only assumptions).*
2= Satisfactory	There were **moderate shortcomings** in relation to the intervention’s relevance/ coherence/ efficiency.	Objectives at outcome level were (or are likely to be) **largely** achieved.	The intervention had (or is likely to have) an **overall positive** impact.	**A majority** of the intervention’s benefits (will) last.
3= Unsatisfactory	There were **important shortcomings** in relation to the intervention’s relevance/ coherence/ efficiency.	Objectives at outcome level were (or are likely to be) only **partially** achieved (at a rather low level). *Note: if outputs are achieved, but do not result in the expected outcomes, consider rating effectiveness as unsatisfactory.*	The intervention had (or is likely to have) **no** impact.	**A minority** of the intervention’s benefits (will) last.
4= Highly unsatisfactory	There were **very severe shortcomings** in relation to the intervention’s relevance/ coherence/ efficiency.	Objectives at outcome level were **not** achieved (or are **un**likely to be achieved).	The intervention had (or is likely to have) an unexpected **negative** impact.	**None** of the intervention’s benefits (will) last.
0= Not assessed	The criteria statement cannot be assessed. Please explain in the justifications section.			

[3] Two guiding principles were set out by the OECD DAC Network on Development Evaluation alongside the definitions of the six criteria. These are:
a. Principle One: The criteria should be applied thoughtfully to support high-quality, useful evaluation.
b. Principle Two: Use of the criteria depends on the purpose of the evaluation.
The OECD guidance Applying Evaluation Criteria Thoughtfully (2021) explains these principles and provides advice as well as examples for the use of the criteria.

[4] See for instance Applying a Human Rights and Gender Equality Lens to the OECD Evaluation Criteria

Along with the assessment grid, please also fill in this table with data on the evaluation, on the evaluated intervention and on the evaluability of the intervention.

Evaluation data			
Title of the evaluation report	External Mid-term evaluation of the Swiss Clean Air Project in India (CAP India)		
Evaluation mandated by	SDC, Embassy of Switzerland, New Delhi, India	Evaluation dates (start – end)	20.07.2023 – 30.11.2023
Evaluation carried out by Name of lead evaluator (if relevant) Name of company	Peter Viaene, Ibrahim Hafeezur Rehman Vlaamse Instelling voor Technologisch Onderzoek (VITO) Sri Harsha Kota (IIT-Delhi) Steinar Larssen (ex NILU)	For external evaluations: Total evaluation budget (including all fees and costs) and currency	CHF 52'911.58
Has any member of the evaluation team been involved in the intervention?	No	If yes, how?	
Evaluated intervention data			
Intervention title (including phase number)	Clean Air Project India (CAP India) Phase 1		
Intervention internal number (if available) (e.g. 7F-…, UR_...)	7F-10093.01	Dates of the evaluated phase (start – end)	01.10.2019 – 30.06.2024
Is it the final phase?	No	Total budget for the evaluated phase; SDC/SECO contribution if applicable	CHF 5'570'276 Contribution: CHF 2'700'000 (research partners and co-financing for pilot projects)
Evaluability[5] assessment by evaluator			
To which extent do you consider that the intervention can be evaluated in a reliable and credible fashion?	2 - reliable		
If applicable, please select the type of limitation(s) to the evaluation and provide a brief explanation *Note: when assessing evaluability also consider the representativeness and participation of specific stakeholders/groups involved in the evaluation as well as the influence of conflict/fragile context on the quality and validity of the data and access to target groups (if applicable)*	☐ Objectives are not adequately defined (e.g. weaknesses in intervention design, lack of baselines and targets) ☒ Results are not verifiable (e.g. too early to tell, lack of sufficiently robust data and evidence) ☐ Other limitation(s) Most results were verifiable but not all activities haven been fully reported and some activities are still ongoing.		

[5] See definition of evaluability in OECD (2023), Glossary of Key Terms in Evaluation and Results Based Management for Sustainable Development (Second edition), OECD Publishing, Paris https://www.oecd-ilibrary.org/docserver/632da462-en-fr-es.pdf?expires=1690787009&id=id&accname=guest&checksum=ED10CC16AE8370653438B9C7A52688E0

DAC criteria and SDC/SECO sub-criteria	Score	Justification (Please provide a short explanation for your score or explain the reason why a criterion was not assessed)
1 Relevance: Is the intervention doing the right things? Summary: The extent to which the intervention's objectives and design (at the time of design and at time of evaluation) respond to beneficiaries' and involved stakeholders' needs and priorities, and continue to do so if circumstances change. *Note: Understanding gendered power dynamics and reflecting on the SDG commitment to "leave no one behind" are crucial in understanding relevance.*	*Please do not write anything here. The DAC criteria score will automatically be calculated as the arithmetic mean of sub-criteria.*	Click here to enter text.
1.1 ***Responsiveness to needs, policies and priorities***: the extent to which the objectives (at output, outcome and impact levels) of the intervention respond to the needs and priorities of the beneficiaries (target group), involved stakeholders (involved in funding, implementing and/or overseeing the intervention) and, when relevant, to indirectly affected stakeholders (e.g. civil society, etc.). *Note: A particular emphasis should be placed on beneficiaries. If there are trade-offs, please describe them in the justification.*	1 - highly satisfactory	The outcomes of the intervention are highly relevant for improving air quality and specifically for NCAP.
1.2 ***Sensitiveness and responsiveness to the context and capacities of the beneficiaries and involved stakeholders****:* the extent to which the context was considered in the design of the intervention (e.g. economic, environmental, equity, social, cultural, political economy and last but not least capacity considerations). *Note: Evaluators are encouraged to describe which contextual factors are most pertinent to the intervention.*	2 - satisfactory	The intervention is well thought through but does not always differentiate between the different types of stakeholders. For the training activities different versions of the courses tailored to the trainees capacities could have been better.
1.3 ***Quality of design****:* the extent to which core design elements of the intervention (such as objectives and their related indicators, logframe, theory of change including related assumptions, choice of services and intervention partners, exit strategy) reflect the needs and priorities of the target group, are appropriate, realistic, clearly defined, measurable and feasible (technical, organisational and financial feasibility). *Note: the exit strategy should be planed from the outset of the intervention to ensure the continuation of positive effects as intended, whilst allowing for changes in contextual conditions.*	2 - satisfactory	The design elements of the intervention reflect the needs and priorities of the target group. The process for selecting the pilot projects took a long time. It seemed like it was difficult to find suitable topics of interest to the cities, and in the end they were developed without enough considerations on the feasibility of scaling them up afterwards.
1.4 ***Adaptation over time****:* the extent to which the intervention has meaningfully adapted to changes over the course of its lifespan (e.g. evolving policy and economic contexts, change of funding, new opportunities, outbreaks of conflict or pandemic, etc.).	2 - satisfactory	The pandemic resulted in many of the contacts and activities being online. Some activities were delayed due to COVID but in the end they still took place.
If an additional sub-criteria is relevant please formulate it here	select	Click here to enter text.
2 Coherence: How well does the intervention fit?	*Please do not write anything here. The DAC criteria score*	Click here to enter text.

DAC criteria and SDC/SECO sub-criteria	Score	Justification (Please provide a short explanation for your score or explain the reason why a criterion was not assessed)
Summary: The compatibility of the evaluated intervention with other interventions in a country, sector or institution, i.e., the extent to which other interventions (in particular policies) support or undermine the intervention and vice versa.	*will automatically be calculated as the arithmetic mean of sub-criteria.*	
2.1 ***Internal policy alignment***: the extent to which the intervention aligns with the wider policy frameworks of the Swiss Development Cooperation, including the most recent Swiss international cooperation strategy overall and at country level, as well as to relevant international norms and standards to which Switzerland adheres (international law, international agreements, etc.).	2 - satisfactory	The intervention aligns with the SDC GPCCE more specifically with strategic component 4. The main concern is probably in this case the evidence-based policy influencing as not all outcomes impact policy to the same extent.
2.2 ***Internal compatibility***: the extent to which the intervention is compatible with other interventions of Swiss development cooperation in the same country/region and thematic field (consistency, complementarity, synergies, avoiding duplication of efforts, subsidiarity). *Note: if feasible, evaluators are encouraged to also take into account compatibility with the interventions of different levels / departments of the Swiss government in the same operating context (e.g.: development, diplomacy, trade, security, etc.)*	2 - satisfactory	Other ongoing SDC projects in India (CEP, CapaCITIES, 3SCA, LCC, GEM) focus on Climate Change (CC). This is only indirectly the case for CAP India.which is however not incompatible with CC.
2.3 ***External compatibility***: the extent to which the intervention is compatible with interventions of other actors in the country and thematic field (complementarity, synergies, overlaps and gaps, value-added, use of existing systems and structures for implementing activities, harmonization, coordination, etc.).	2 - satisfactory	The intervention addresses the air quality in 4 non-attainment cities. This is in line with NCAP that requires devising Clean Air Action Plans at the city level. However as a significant part of the air pollution in the city is due to emission sources outside the city, a broader approach considering the airshed would be more suitable. This is also what the World Bank advocates in its intervention for the Indo-Gangetic Plain. NCAP also considers State-wide action plans.
If an additional sub-criteria is relevant please formulate it here	select	Click here to enter text.
3 Effectiveness: Is the intervention achieving its objectives? Summary: The extent to which the intervention achieved, or is expected to achieve, its objectives and its results, including any differential results across groups.	*Please do not write anything here. The DAC criteria score will automatically be calculated as the arithmetic mean of sub-criteria.*	Click here to enter text.
3.1 ***Achievement of objectives****:* The extent to which the intervention achieved or is expected to achieve its intended objectives (outputs and outcomes) as originally planned (or as modified to cater for changes in the environment), including its transversal objectives (e.g. gender, climate)	2 - satisfactory	In general objectives have been achieved or will be achieved by the end of the project. Delays are often due to COVID. The most conspicuous omissions are related to the pilot projects. This was a very promising part of the intervention design that turned out to be more difficult to realise in the end.

DAC criteria and SDC/SECO sub-criteria	Score	Justification (Please provide a short explanation for your score or explain the reason why a criterion was not assessed)
*Note: If some – but not all – of the objectives were achieved the evaluators will need to examine their **relative importance** to draw conclusions on the effectiveness.*		
3.2 ***Unintended effects***: The extent to which the intervention has responded adequately to the potential benefits/risks of the positive/negative unintended results.	1 - highly satisfactory	The evaluation could not find any unintended effects.
3.3 ***Differential results****:* the extent to which the intervention results (outcomes) were inclusive and equitable amongst beneficiary groups and the extent to which key principles such as non-discrimination, accountability and leave-no-one-behind were taken into account during the implementation.	2 - satisfactory	Where the intervention design had often foreseen outputs in all four cities this is often not the case. This is partially due to differences between the local authorities where the engagement of Lucknow is clearly much stronger than for Kanpur or Nashik but this in itself does not explain all the differences in the outputs for the cities.
If an additional sub-criteria is relevant please formulate it here	select	Click here to enter text.
4 Efficiency: How well are resources being used? Summary: The extent to which the intervention delivers, or is likely to deliver, results in an economic and timely way.	*Please do not write anything here. The DAC criteria score will automatically be calculated.*	Click here to enter text.
4.1 ***Economic efficiency*****:** The extent to which the intervention delivered the results (inputs → outputs; inputs → outcomes) in the most cost-efficient way possible (including allocation of resources between target groups and time periods; available options for purchasing inputs according to market conditions, etc.).	2 - satisfactory	The intervention was executed within the budget foreseen and distribution of funding between the research and implementation components is reasonable. A detailed assessment of the economic efficiency for individual activities was however not possible based on the financial statements provided.
4.2 ***Timeliness*****:** The extent to which the intervention delivered the results (outputs, outcomes) in a timely manner (within the intended timeframe or reasonably adjusted timeframe) and the extent to which efforts were made to mitigate delays. *Note: in case timeliness was unsatisfactory for reasons outside of the intervention's control, the rating should still be unsatisfactory and explanation provided in the justification field.*	2 - satisfactory	Some of the activities were delayed due to COVID and were adjusted or are not completed yet because of this. Activities that require interactions with multiple actors such as the implementation of the pilot projects or the international exposure visits where candidates have to be proposed by the stakeholders are clearly difficult to organise and have either been downsized or delayed.
4.3 ***Operational efficiency***: The extent to which management, monitoring and steering mechanisms supported efficient implementation (resource allocation, spending and redirection, risk management, logistics and procurement decisions, etc.)	2 - satisfactory	In general the intervention is correctly managed. While there are regular meetings between the research and implementation components, for the project an overarching management for the two components together would have been preferable.
If an additional sub-criteria is relevant please formulate it here	select	Click here to enter text.
5 Impact: What difference does the intervention make? Summary: The extent to which the intervention has generated or is expected to generate significant positive or negative, intended or unintended, higher-level effects. Impact	*Please do not write anything here. The DAC criteria score*	Click here to enter text.

DAC criteria and SDC/SECO sub-criteria	Score	Justification (Please provide a short explanation for your score or explain the reason why a criterion was not assessed)
addresses the ultimate significance and potentially transformative effects of the intervention. It seeks to identify social, environmental and economic indirect, secondary and potential consequences of the intervention that are longer term or broader in scope than those already captured under the effectiveness criterion. It does so by examining the holistic and enduring changes in systems or norms, and potential effects on people's well-being, human rights, gender equality, and the environment. *Note: depending on the timing of the evaluation and the timescale of intended benefits, evaluators can assess for both actual impacts (i.e. already evident) and foreseeable impacts.*	*will automatically be calculated as the arithmetic mean of sub-criteria.*	
5.1 ***Intended impacts***: The extent to which the intended (planned and, where applicable, revised) 'higher-level effects' (i.e. lasting changes in the lives of beneficiaries) of the intervention were (or are expected to be) achieved. *Note: also consider the extent to which the intervention contributed to "holistic and enduring changes in systems or norms" and transformational change (addressing root causes or systemic drivers of poverty, inequalities, exclusion and environmental damage).*	2 - satisfactory	The main, intended ´high-level´ impact of CAP India is an improvement in air quality. Where the project does claim such an improvement based on an analysis of observed pollutant concentrations, the latter is in our view mainly attributable to other on-going Indian interventions, and not only to CAP India. This does not imply that we consider the project has no impact: assuming uptake of the project outcomes by policy, these should result in improvements to air quality.
5.2 ***Contribution to intended impacts:*** The extent to which the intervention actually contributed (or is expected to contribute) to the intended higher-level effects. *Note: results of contribution analysis, etc.*	2 - satisfactory	The project partners have presented the results for the outputs to the stakeholders and the fact that the reports are published indicates that these are also endorsed by the authorities. Actual uptake of the intervention results in policy is at this moment still limited and a sustained, proactive interaction with those in charge will be needed to see a bigger impact.
5.3 ***Unintended impacts***: Has the intervention brought about (or is it expected to bring about) any unintended (positive and/or negative) higher-level development results? If yes, to what extent have these higher-level effects been positive (or are likely to be positive)? *Note: consider here any kind of unintended effects such as escalating or deescalating effect on a conflict or context of fragility, effect on the legitimacy of the state or non-state actors, effect on the inclusion or exclusion of vulnerable groups, unintended pollution, etc.* *If there wasn't any noteworthy unintended impact (higher-level effect), mark this question as non-applicable (n/a) and do not give a rating.*	0 - not determined	Not applicable
5.4 ***Differential impact***: the extent to which the intervention's intended and unintended higher-level results (impacts) were (or are expected to be) inclusive and equitable amongst beneficiary groups and the extent to which key principles such as non-discrimination, accountability and leave-no-one-behind were taken into account during the implementation. *Note: Keep in mind that positive impacts overall can hide significant negative distributional effects.*	3 - unsatisfactory	Differential impact was not considered explicitly in the project. Capacity building did not take into account differences in the capacity of the trainees. The research component should have ensured that its results were also useful for the partners of the implementation component and the stakeholders in general by presenting these in a form suited to their needs.

DAC criteria and SDC/SECO sub-criteria	Score	Justification (Please provide a short explanation for your score or explain the reason why a criterion was not assessed)
If an additional sub-criteria is relevant please formulate it here	select	Click here to enter text.
6 Sustainability: Will the benefits last? Summary: The extent to which the net benefits of the intervention continue or are likely to continue. Includes an examination of the enabling environment for sustainable development, i.e. financial, economic, social, environmental, and institutional capacities of the systems needed to sustain net benefits over time. Involves analysis of resilience, risks and potential trade-offs. *Note: depending on the timing of the evaluation and the timescale of intended benefits, evaluators can assess for both actual sustainability (i.e. the continuation of net benefits created by the intervention that are already evident) and prospective sustainability (i.e. the net benefits for key stakeholders that are likely to continue into the future)*	*Please do not write anything here. The DAC criteria score will automatically be calculated as the arithmetic mean of sub-criteria.*	Click here to enter text.
6.1 ***Capacity and resilience development***: The extent to which the beneficiaries and development partners have strengthened their capacities (at the individual, community, or institutional level), have the resilience to overcome future risks and external shocks that could jeopardise the intervention's results and have improved their ownership or political will.	2 - satisfactory	Numerous training and awareness activities were organised. It is however difficult to assess what the lasting impact of these activities will be as a pre/post assessment for the activities and feedback from the trainees is almost always missing. .It is to be expected that the rather extensive training has resulted in improvements in capacity both individually and institutionally. It has been voiced as a risk that it is difficult for institutions to keep experienced personnel over time.
6.2 ***Financial sustainability***: The extent to which development partners have the financial resources to maintain the intervention's net benefits over time (e.g. increased national, and where applicable subnational, financial or budgetary commitments).	3 - unsatisfactory	Not all outcomes will require continued financing (i.e. some will be completed) but when financing was discussed with CPCB it was mentioned that sustained external financing will be needed for continuity from multiple sources and that depending on that financing all or a selection of activities will be pursued.
6.3 ***Contextual factors***: The extent to which the context is conducive to maintain the intervention's net benefits over time (e.g. policy or strategy change; legislative reform; institutional reforms; governance reforms; increased accountability for public expenditures; improved processes for public consultation in development planning). *Note: It includes assessing the trade-offs associated between instant outcomes and potential longer-term effects as well as the trade-offs between financial, economic, social and environmental aspects.*	2 - satisfactory	Air quality is clearly and rightly a hot topic in India so there is certainly a need for interventions such as CAP India. During the interactions with stakeholders these clearly indicated an interest in maintaining the program.
If an additional sub-criteria is relevant please formulate it here	select	Click here to enter text.
7 General comments Summary: this section is only for free text (no score). The evaluator may provide an overall assessment of the evaluated intervention, explore and reflect on relationships and synergies between different criteria (this includes considering if and how they are causally related).		Click here to enter text.

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