

EXTERNAL EVALUATION – SHORT REPORT

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Strengthening the Quality Infrastructure in Environmental Analytics –
Cooperation on Environmental Measurement in India (CEMI)

Country | Region: India
Project No.: 2011.2073.2 - 95072
Period: 07/2012 – 12/2016
Executing Agency: Ministry of Environment and Forests (MoEF)
Implementing Partner: National Physical Laboratory (NPL)
PTB | Working Group: Q.52
PTB | Project Coordinator: Dr. Michael Brinkschröder
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List of abbreviations

APMP	Asia Pacific Metrology Program
BIPM	Bureau International des Poids et Mesures
BMZ	German Ministry for Economic Cooperation and Development
CCQM	Consultative Committee for Amount of Substance (French: Comité Consultatif pour la Quantité de Matière)
CEMI	Cooperation on Environmental Measurement in India
CIPM	International Committee for Weights and Measures
CMC	Calibration and Measurement Capabilities
CPCB	Central Pollution Control Board
CRM	Certified Reference Material
DAC	Development Assistant Committee of the OECD
DI	Designated Institute
IITR	Indian Institute of Toxicology Research
MiC	Metrology in Chemistry
MoEF	Ministry of Environment and Forestry
MRA	Mutual Recognition Arrangement
NABL	National Accreditation Board for Testing and Calibration Laboratories
NEERI	National Environmental Engineering Research Institute
NMI	National Metrology Institute
NPL	National Physical Laboratory, India
OECD	Organization for Economic Cooperation and Development
PT	Proficiency Testing
PTB	Physikalisch-Technische Bundesanstalt – German National Metrology Institute

1. Project Description

On behalf of the German Ministry for Economic Cooperation and Development (BMZ), the National Physical Laboratory (NPL) as the Indian National Metrology Institute (NMI) and the Physikalisch-Technische Bundesanstalt (PTB) are jointly implementing the project “Strengthening the Quality Infrastructure in Environmental Analytics – Cooperation on Environmental Measurement in India (CEMI)”. The objective of this Metrology in Chemistry (MiC) project is stated as follows:

“Environmental Action Strategies are based on reliable and internationally integrated environmental analytics”.

To achieve this objective, four components were developed:

- (i) Development of a national network of Designated Institutes (DI).
- (ii) International integration of national network partners.
- (iii) Strengthening metrological traceability in specific areas of environmental measurement.
- (iv) Raising awareness.

Besides the NPL, the National Environmental Engineering Research Institute (NEERI), the Indian Institute of Toxicology Research (IITR), the Central Pollution Control Board (CPCB) and the National Accreditation Board for Testing and Calibration Laboratories (NABL) are further implementation partners. The political partner is the Ministry of Environment and Forestry. The project has a life span of 4.5 years (07/2012 – 12/2016) and a budget of 1.5 Million Euro. The evaluation was carried out in July 2016 by Annette Schmidt (key evaluator), Dr. James Tshilongo (technical evaluator) and Gina Burger (PTB).

2. Assessment of the project

2.1 Status of the change process

Relevance

Although there was no systematic examination of the target groups’ core problem before the project design was developed, there is no doubt that the project is relevant for the target group, which is identified as “the Indian population in the mega cities and the population in the highly polluted regional areas”. It is of prime interest that policy makers and implementers set up the right strategies to mitigate environmental contamination in fields such as air, water and soil. This can only be realized when reliable data is available regarding the main polluter and the main polluting substances. A solid monitoring network with clear criteria and objectives is needed. Monitoring data need to be incontestable so that civil society groups could use them in court against the polluters. But sound and accurate environmental measurements are not only relevant for people’s quality of life and the health but also for the economic development of India. It can be stated that the project idea of the development of a network where each institution has its role and clear mandate is definitely the right approach. This strategy also acknowledges that it is impossible for an institution to do everything on its own and that the sharing of tasks and responsibilities and close cooperation can be a win-win situation for everyone involved. This also holds true with regard to international good practices and commonly accepted standards, where this idea of networking has been carried out with success.

The DAC-criterion relevance is rated “very good” (1).

Effectiveness

Component 1: Development of a national network of Designated Institutes

Indicator 3: Agreements have been concluded between the National Metrology Institute and Designated Institutes.

Findings: The intended DIs for the field of environment are NEERI and IITR, with whom NPL signed two Memoranda of Understanding. This resulted in members of DIs gaining exposure to the international networks, such as Consultative Committee for Amount of Substance (CCQM) etc. However, for the two DIs, the international Mutual Recognition Arrangement of the International Committee for Weights and Measures (CIPM-MRA), recognition status has not yet been achieved and a road-map to get there has not been developed. It is also not clear whether the advantages as well as responsibilities of being a DI are fully understood.

Indicator 2: India demonstrates its measurement capabilities in the areas relevant for environmental analytics through registered entries in the International Calibration and Measurement Capabilities (CMC) database, for at least 2 parameters in the fields of air and water.

Findings: NPL and DIs have successfully participated in regional and international key comparisons, and the equipment that PTB purchased is being used. Skills and knowledge of the employees from the various DIs and the NPL have improved. However, the expertise is not yet sufficient and India has not demonstrated its measurement capabilities in the areas relevant to environmental analytics for the parameters in the CEMI project through registered entries in the Bureau International des Poids et Mesures (BIPM) Key Comparison Database.

Component 2: International integration of national network partners

Indicator 4: India participates in regional or international comparisons for air and water.

Findings: Some members of NPL and DIs have had the opportunity to attend CCQM and APMP-TCQM meetings and training sessions since the inception of the project. Employees were also participating in on-going international comparisons and various Proficiency Testing (PT)-schemes. The selection of the personnel to attend the training sessions was a frequently disputed issue between PTB and the partners and, according to PTB and the international experts, not always in line with the aim of the project objectives.

Component 3: Strengthening metrological traceability in specific areas of environmental measurement

Indicator 5: The traceability chain in the fields of air and water is realized by means of certified reference materials for at least 2 parameters.

Findings: NEERI has successfully produced the reference materials in water and has already started with the PT-scheme process as part of the dissemination to local industry. NPL has set up methods to do the analysis of gases and solutions. However, the produced certified reference materials (CRM) of gases have not yet been disseminated to the local industries. The CRM for soil is far from being realized. Accreditation for reference material producers for air, water and soil is not yet in place.

Indicator 6: Environmental laboratories at the national and the federal level are supported by means of benchmarking and other related training measures (e.g. comparison measurements) within the scope of their surveillance and monitoring tasks.

Findings: Members of the NPL and DIs have received sufficient training locally or internationally through technical experts' advice. Most of the training focuses more on the technical skills and on how to perform the PT-schemes. All of the training sessions were highly appreciated by the partners. Unfortunately, a relevant partner, the Karnataka State Pollution Control Board, had left the project because of lack of human capacity.

Component 4: Raising awareness

Indicator 1: Political decision-makers and civil society associations confirm their confidence in the measurement results in the area of environmental analytics.

Findings: The commitment of the partners to this component was very limited, and one result of this was that a work package as designed for the other components was never developed. According to their own assessment, raising awareness is not one of their key competences and they felt over-challenged with this task. Hence it is very unfortunate that the consultation proposals of the intermittent short-term expert regarding the setting-up of structures to target stakeholder engagement were not followed up on. However, some activities were carried out belonging to this component, although they were not oriented to the group mentioned in the indicator but to the peers of the implementing partners.

The DAC-criterion effectiveness is rated “satisfactory” (3).

Impact

The four components with their strong emphasis on capacity building encompass the development of a national MiC network with formally Designated Institutes and their international integration. The components address the strengthening of metrological traceability in environmental measurement and the awareness-raising adequate for reaching the long-term effects, such as improved pollution control strategy policies and hence improved quality of life. But unfortunately, the project is still in an early stage and therefore the impact so far has been very limited. This holds true for the technical progress as well as for the managerial aspects, like creating awareness and dissemination of knowledge about MiC and its benefits. Overarching long-term results could possibly have been better achieved with stronger involvement of relevant stakeholders such as industry associations, “environmental industries”, e.g. reference gas producers, producers of measurement devices and environmental think tanks in the project planning and implementation.

The DAC-criterion impact is rated “satisfactory” (3).

Efficiency

It is hard to judge whether the use of the project resources is appropriate with regard to the ratio between cost and output and cost and outcome, as the newly developed PTB-tool for attributing costs to project components has not yet been applied in this project. But generally speaking, there is no reason to assume that the project is not successful in this regard. Training in general seems to be effective, beneficial and relevant. Unfortunately, some of the partners were integrated late and consequently activities were delayed or not realized at all. As the project is constructed in such a way that the different projects’ activities are interdependent, this affected not only one organization but had also negative impact on the progress and results of the other organizations involved.

One major problem that limited the efficiency of the project was the constant conflict between PTB and the partners regarding finances. To accelerate the existing Indian administration, a Financial Arrangement between PTB and NPL was agreed upon, where a small fund has been made available locally. However, this idea which seemed good at first glance led to constant discussions between the project coordinator and his partners. As a result, instead of speeding up efficiency, efficiency was hampered, because a lot of time was spent in discussions about money.

The DAC-criterion efficiency is rated “satisfactory” (3).

Sustainability

According to the evaluation team's assessment, the positive results achieved so far, such as capacity development through staff training and knowledge and know-how transfer, will be durable, as they are mainstreamed into the partner system and have become part of the daily routine in the labs. Whether the partners are really interested and willing to apply this newly acquired knowledge to other parameters is not yet clear. Some of the partners seem very aware that it will be their role in the future to cope with these costs, whereas others constantly requested financial support. The project facilitated the integration of NPL and its DIs into the international scientific communities of CCQM and APMP. Provided that the necessary budgets can be secured by the Indian partners to allow participation at future meetings, these exposure and contacts are expected to have a sustainable effect on India's involvement in expert networks. It can also be rated as positive that according to almost all of the interview partners, the relationship between the NPL, CPCB and the DIs has improved, and not only on the management level. The scientists and technicians can identify their partners and have developed relations with them. What probably will affect the sustainability in a negative way is the lack of long lasting political commitment for the project. The project did not aim to develop a relationship or any contact with the political partner MoEF. So the financial or political support is uncertain.

The DAC-criterion sustainability is rated "satisfactory" (3).

2.2 Success factors for the observed results and change processes

Strategy

The strategic orientation of the project expressed in the four components is the right approach for pushing the issue of MiC in India forward. The same holds true for the operational level such as the work packages. The evaluation team perceived an attribution gap between the formulated objective of the project, which states: "Environmental Action Strategies are based on reliable and internationally integrated environmental analytics", and the four components. Even though progress with respect to the components can be measured, it is hard to judge whether the objective itself has been reached or not. It was never defined which Environmental Action Strategies were meant, there was no baseline developed as to whether and how the issue of environmental analytics should be dealt with in the Strategies, and no concept was created about how progress could be measured or attributed to the project results.

Cooperation

The project was developed towards the end of the last project phase together with NPL, but the political partner was not involved. Their integration proved to be difficult. In the beginning of the current phase the partners were invited to submit their work-packages, which some of them could do easily whereas others needed a lot of time. This bottom-up approach is certainly the right approach. During the term of the project, ideas for next steps to be realized mainly came from PTB, while responses from the partners were mostly slow and limited. Undoubtedly due to the project, contact and communication among the different project partners have significantly improved. But the communication never went smoothly. Inclusive or participative management styles are not the predominant way the partner institutes interlink people, but exactly this is needed if a network with equal partners is to be established.

Steering structure

A steering committee that includes all relevant partners is in place and meets regularly twice a year. With the exception of MoEF, the partner institutions attended regularly. All interview partners consider these meetings as crucial for the project's progress. Important decisions regarding the next activities are taken at these meetings, professional exchange is possible, and PTB often invites experts from Germany or includes them in the meetings via skype. But still there are some communication and interaction challenges within the project. Strong personalities which are not easy to steer are one, but unclear roles and relationships are also among the challenges. For instance, the role of the project coordinator on the partner side was never sufficiently defined or communicated to all partners, which led to communication failures, delays of activities and lack of ownership of activities by some partners.

Processes

Regarding the project objective, the appropriate core processes were identified and defined in the form of work packages. As they were developed by the partner institutions in coordination with the technical experts, they contributed to a common understanding of the capacities to be developed and the changes to be implemented. Necessary steering processes were addressed by the steering committee with respect to activities and their monitoring. Since no results-based monitoring was established, its potential for strategic steering could not be exploited. Auxiliary processes, especially the organization of training and expert missions by PTB, were well received and facilitated progress with regard to the core processes. But the lack of a common understanding about some of these processes (financing and financial arrangements) proved to be a major obstacle for the implementation of core processes.

Learning and innovation

The main focus of the project was capacity building on the individual level. Technical knowledge was acquired by the staff of all partner organizations. Knowledge sharing between the trained personnel and their colleagues was organized internally through meetings and workshops. Even where progress was slower, a general understanding of metrology and measurement uncertainty was acquired that will positively impact the individual approach towards analytical tasks and research in the future. However, this strong focus on individual learning proved to have its limitations. Acquired knowledge is about to be lost due to trained personnel leaving their institution (retirement, expired contracts).

3. Learning processes and learning experience

The previous CEMI-evaluation from 2011 highly recommended establishing a steering committee, where all involved partners should be represented. Its objective should be to jointly develop a work plan with defined responsibilities and time lines which than should be endorsed by the committee. Monitoring progress, supervising the activities and intermediate results and taking corrective actions as well as making proposals for new activities should also be its tasks. This recommendation has been implemented and has proven to be very good. The steering committee was the back-bone of the project, participation was high. During the evaluation quite a few interviewees referred to the committee as crucial. Some interview partners mentioned that the time in between the committee meetings – normally six months - was too long, and that an additional meeting to structure the work would have helped to speed up the implementation process.

The projects very successfully created an advisory group of mostly retired and thus time-flexible and highly competent experts that were motivated to improve the MiC system in India. The approach of



using the advisory service combined with exposure trips and conference participation overseas, proved to be very effective and also appreciated by the partners. Regrettably and also somewhat incomprehensibly the time span between the advisory visits was not used as most of the experts expected it to be, so that progress was limited. Some of the experts explained these delays with the fact that the tasks for the project were an additional burden for the labs for which there was no time in the daily routine. The interviewees did not confirm this “theory” of the additional work load. From what they said, the delays just seemed to be due to the way work is organized in laboratories in India.

The concept followed in the project of developing a network where each institution has its role and clear mandate is definitely the right approach. This strategy also acknowledges that it is impossible for an institution to do everything on its own, and that the sharing of tasks and responsibilities and close cooperation can be a win-win situation for everyone involved. This also holds true with regard to international good practices and commonly accepted standards, where this idea of networking has been carried out with success. Unfortunately, it was not possible to include a bigger number of tentative DIs into the project, possibly due to a lack of interest in metrology aspects. Now, almost four years later, a new attempt should be made to identify cooperation partners, as experience has also shown that participation can be very unpredictable. Highly interested organizations can – mostly due to a change in the management – completely lose interest. But luckily the project also had the opposite experience. In any case, a key number of partners should be considered and included to be prepared for ups and downs.

And a final note regarding the evaluation team: The team of the key evaluator and the technical evaluator was accompanied by a PTB-project coordinator from another geographical area. The idea behind this choice was that PTB wants to promote institutional learning and an exchange between the different working groups. The idea proved to be very good, in that the project coordinator became an equal contributor who – due to knowledge of PTB approaches – added value to the team. The evaluator wants to encourage PTB to assimilate this exchange into the normal routine.

4. Recommendations

Training, skills development as well as networking all need to be continued. As disagreements between the partner and the PTB occurred about which person to send to a training session, clear strategies should be developed, based on a human resource development plan, as to who to send, for how long and where.

Target groups such as industry associations, civil society and think tanks should be included in project planning based on a stakeholder engagement plan to assure that the target group needs are met.

The communication among all parties has to be strengthened. Although the steering committee is very well established, roles and responsibilities of project partners need to be more clearly defined, documented and approved by all partners. Consistent follow-ups and monitoring sessions need to be agreed upon to ensure the quality of the results and to avoid unnecessary delays.

NPL and DIs should develop a roadmap that will enable the DIs to be internationally recognized as DIs. This should include the demonstration of international measurement equivalence for measurement confidence as a foundation for the CRM programme. As the work done by the DIs is seen as highly relevant, the fulfilment of the requirements to become official DIs would enhance the strategic objective of this project (e.g. claiming CMCs, sustainability).

Both NPL and DIs should work towards international peer review or ISO 17025 accreditation as soon as possible - even if the scope is limited - to submit CMCs to APMP region. The focus should be on proving capability in core activities as defined in CCQM working group strategies. This includes the promised filing of CMCs of CO and CO₂ components and others, as it takes time and it also includes



accreditation status of ISO Guide 34 for production of Reference Material.

Additionally, the particle matter size measurement should be included, as this is seen as an urgent concern for the country. Another aspect could be to establish the process for verifying and certifying instruments measuring the air matrix, as current values that are measured may not be of reliable. It will also be of interest to involve Universities and other Research and Development Institutions and their laboratories, as private sector laboratories will in future be more and more entrusted with tasks of environmental analyses, monitoring and control activities.

As staff turnover is an aspect that strongly jeopardizes the sustainability of all technical cooperation projects, it is recommended that more intensive work be done on the issue of knowledge management within institutions. An interesting approach could be to design a component within a project where strategies were developed and tested for profound and structured knowledge dissemination and a reporting system, and where guidelines were created that could be applied to other projects.

To ensure sustainability and impact, the political buy-in is crucial. The project design and the activities have to focus more strongly on raising awareness to achieve political support and backing. Proximity to the political partners must be sought.

PTB should not deviate from their usual financing scheme, because deviation caused a lot of misunderstandings, frustration and tension between the PTB project coordinator and the local coordinator. It resulted in a higher work load for the project coordinator and possibly also delays in the project execution.

To facilitate sustainability, it is indispensable that the partner show a stronger financial commitment. One burning issue is that expenses for training sessions and for visits to international meetings need to be shared among the partners and PTB. A sliding scale where the partner assumes more responsibility step by step is recommended. More strongly directing advocacy for MiC toward the political partners could be helpful in this regard.