Physikalisch-Technische Bundesanstalt
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INTERNATIONAL COOPERATION

EXTERNAL EVALUATION - SHORT REPORT

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Project Title: Strengthening Quality Infrastructure for Monitoring of the River Ganga II

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Lead executing agency:	National Metrology Institute of Germany (Physikalisch-Technische Bundesanstalt, PTB)
Executing agency:	National Mission for Clean Ganga (NMCG)
PTB | Section:	Group Q.3
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This evaluation is an independent assessment. Its contents reflect the assessor's opinion which is not necessarily equivalent to PTB's view.

List of Abbreviations

Abbreviation	Full Form
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (Federal Ministry for Economic Cooperation and Development, Germany)
BOD	Biochemical Oxygen Demand
BIS	Bureau of Indian Standards
CPCB	Central Pollution Control Board
CW	Capacity WORKS
CWC	Central Water Commission
DC	Development Cooperation
DeGEval	Deutsche Gesellschaft für Evaluation (German Association for Evaluation)
DO	Dissolved Oxygen
EUR	Euro
FC	Financial Cooperation
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Agency for International Cooperation)
IEC	International Electrotechnical Commission
IEWP	Indo-European Water Partnership
iKZE	Intermittent Short-Term Expert (Interner Kurzzeiteinsatz)
ISO	International Organization for Standardization
JICA	Japan International Cooperation Agency
JRF	Junior Research Fellow
KfW	Kreditanstalt für Wiederaufbau (German Development Bank)
MOEFCC	Ministry of Environment, Forest and Climate Change
MU	Measurement Uncertainty
NABL	National Accreditation Board for Testing and Calibration Laboratories
NEERI	National Environmental Engineering Research Institute
NMCG	National Mission for Clean Ganga
NPL	National Physical Laboratory
OECD-DAC	Organisation for Economic Co-operation and Development – Development Assistance Committee
OP	Operational Plan
PA	Project Assistant
PK	Project Coordinator
PTB	Physikalisch-Technische Bundesanstalt (National Metrology Institute of Germany)
QCI	Quality Council of India
SC	Steering Committee
SDG	Sustainable Development Goal
SGR III	Support to Ganga Rejuvenation III (GIZ Project)
SMCG	State Mission for Clean Ganga
SPCB	State Pollution Control Board
SuWaVi	Sustainable Water Management and Wastewater Value Chains (GIZ Project)
TC	Technical Cooperation
TG	Technical Evaluator
UK	Uttarakhand
UP	Uttar Pradesh

1. Executive summary of the project

This short report summarises the findings of the external evaluation of the bilateral Technical Cooperation project “Strengthening Quality Infrastructure for Monitoring of the River Ganga – Phase II” (hereafter: Ganga II). The project is implemented by the National Metrology Institute of Germany (PTB) in cooperation with the National Mission for Clean Ganga (NMCG) and has been commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ) under the Development Cooperation Programme “Sustainable Urban Development in India”.

The evaluation was undertaken for accountability and learning purposes and followed the standards of the German Association for Evaluation (DeGEval). It applied the OECD-DAC criteria of relevance, coherence, effectiveness, efficiency, impact, and sustainability. The Capacity WORKS success factors were integrated into the assessment of effectiveness.

The evaluation team assesses the project as highly relevant and well aligned with Indian priorities, BMZ strategies, and the Ganga Narrative. It has made substantial progress in strengthening laboratory quality infrastructure, particularly in the states of Uttarakhand and Uttar Pradesh, and has contributed to improved reliability and credibility of water quality data. While the project’s contribution to higher-level development results (impact) is necessarily indirect, it provides a critical foundation for evidence-based pollution control and river rejuvenation measures. Overall, the project is assessed as successful to very successful, with an overall grade of **1.7**.

Project Context

The Ganga River Basin is home to more than 500 million people and is central to India’s cultural, ecological, and economic systems. Stretching across several states and supporting dense urban settlements, agricultural livelihoods, and industrial clusters, the basin plays a critical role in national development. At the same time, it faces severe and persistent pressures from pollution arising from untreated or inadequately treated municipal wastewater, industrial effluents, and diffuse sources such as agricultural runoff (fertilisers and pesticides) and solid waste. These pressures pose significant risks to public health, aquatic ecosystems, biodiversity, and the long-term sustainability of water resources.

Over the past decade, the Government of India has made substantial investments under the Namami Gange programme to address these challenges, including large-scale infrastructure projects for sewage treatment, riverfront development, and river water cleaning. Despite this progress, improvements in water quality have remained uneven across the basin. One of the key systemic bottlenecks identified by national authorities and development partners alike has been the lack of reliable, standardised, and quality-assured water quality data. Inconsistent sampling practices, variable laboratory capacities, and limited application of internationally recognised quality assurance standards have constrained the ability of regulators and planners to identify priority pollution sources, design targeted interventions, and credibly assess the effectiveness of investments.

In this context, strengthening the quality infrastructure for water monitoring has emerged as a strategic priority. Reliable and comparable data are a prerequisite not only for regulatory enforcement and compliance monitoring, but also for basin-level planning, inter-state coordination, and transparent public communication. Without robust quality assurance systems, even significant financial investments risk being undermined by weak evidence bases and limited accountability.

The Ganga II project responds directly to this gap by focusing on the institutional and technical foundations of water quality monitoring.

Project Partners

- National Mission for Clean Ganga (NMCG)
- National Physical Laboratory (NPL)
- Central Pollution Control Board (CPCB)
- State Pollution Control Boards (SPCBs) of Uttarakhand and Uttar Pradesh

Project Objective and Outputs

The project's objective is that laboratories and authorities responsible for water monitoring in the Ganga catchment area apply recognised quality assurance methods in data collection, evaluation, and reporting. This objective reflects the project's focus on improving the credibility, comparability, and usability of water quality data for regulatory, planning, and policy purposes.

This objective is pursued through three outputs:

- Strengthening the competence of authorities responsible for planning, implementing, and using water quality monitoring programmes.
- Strengthening laboratories in quality management, sampling, and analytical competence.
- Improving coordination and exchange among water quality monitoring authorities and other quality infrastructure stakeholders.

2. Evaluation of the project

Objective and Evaluation Period

The evaluation serves two primary and complementary purposes. First, it fulfils an accountability function towards the Federal Ministry for Economic Cooperation and Development (BMZ) and the Indian partner institutions by assessing the extent to which the project has achieved its intended objectives and used public resources in an effective and efficient manner. Second, it serves an explicit learning function for PTB and its partners by identifying strengths, limitations, and implementation lessons that can inform ongoing project management as well as the design of a potential follow-on phase.

The evaluation covers the period from the start of project implementation in May 2023 until October 2025. It therefore captures both early implementation dynamics and more mature results, allowing for a balanced assessment of progress, emerging outcomes, and remaining challenges prior to project completion in April 2026.

Scope of the Evaluation

The evaluation assessed the project at outcome and output levels, with particular attention to institutional and capacity development results in the areas of laboratory accreditation, quality management systems, metrology, and inter-institutional coordination. In line with the nature of the intervention as a technical cooperation project, the evaluation did not seek to establish direct causal attribution to changes in river water quality, but rather examined the plausibility of the project's contribution to higher-level development results through improved data quality and governance processes.

The evaluation applied the six OECD-DAC criteria - relevance, coherence, effectiveness, efficiency, impact (higher-level development results), and sustainability - as its analytical framework. In addition, elements of the Capacity WORKS success factors (strategy, cooperation, steering structure, processes, and learning and innovation) were integrated into the assessment of effectiveness in order to better capture institutional performance and change processes.

Methodological Approach

The evaluation adopted a mixed-methods approach designed to triangulate evidence from multiple sources and perspectives. Methods included a systematic review of key project documents such as the project proposal, operational plans, progress reports, expert studies, and monitoring data. This document analysis provided the basis for assessing planned versus achieved results and for understanding the project's strategic logic.

In addition, structured and semi-structured interviews were conducted with a wide range of stakeholders, including PTB project staff, representatives of the National Mission for Clean Ganga (NMCG), the Central Pollution Control Board (CPCB), State Pollution Control Boards (SPCBs), State Missions for Clean Ganga (SMCGs), the National Physical Laboratory (NPL), and other relevant institutions. These interviews captured stakeholder perspectives on relevance, implementation quality, results achieved, and remaining gaps.

Field visits to selected laboratories and partner institutions in Delhi, Uttarakhand, and Uttar Pradesh formed an important component of the methodology. These visits enabled direct observation of laboratory infrastructure, quality management practices, and staff capacities, thereby providing empirical grounding for the assessment of capacity development outcomes. Where appropriate, findings from field observations were cross-checked with documentary evidence and interview data.

Preliminary findings were discussed and validated through a debriefing workshop with project partners, allowing for clarification of interpretations and strengthening the credibility of conclusions. Data triangulation across documents, interviews, and field observations was used systematically to enhance robustness.

Limitations

The main limitations of the evaluation relate to the large number of evaluation dimensions and indicators associated with the OECD-DAC framework and to the inherently indirect nature of higher-level environmental and social impacts in a technical cooperation project of this type. Time constraints and the geographic spread of partners also limited the depth of engagement with all stakeholders. These limitations were mitigated through prioritisation of key evaluation questions and careful triangulation of available evidence.

The six OECD/DAC criteria were used as an evaluation basis for this evaluation:

- Relevance: Is the project doing the right things?
- Coherence: How well does the project fit?
- Effectiveness: Is the project achieving its objectives?
- Impact (higher-level development results): What difference does the project make?
- Efficiency: How well are resources being used?
- Sustainability: Will the results last?

The following marking scale was used for the evaluation:

1	2	3	4	5	6
very successful	successful	successful to a limited extent	rather unsuccessful	mainly unsuccessful	entirely unsuccessful

Overall, the project received the mark: **1.7** (successful).

Relevance

The project is strongly aligned with key Indian national priorities, including the Namami Gange programme, the SDG 6 on water and sanitation, the National Water Quality Monitoring Programme, and India's evolving river basin management approach. In recent years, national policy discourse has increasingly emphasised the need for scientifically robust, standardised, and comparable water quality data as a foundation for effective river basin governance. By placing quality assurance, metrology, and laboratory accreditation at the centre of its intervention logic, the project responds directly to this policy shift and addresses a widely recognised systemic bottleneck in the Ganga rejuvenation effort: the persistent lack of reliable and decision-grade data to inform regulation, enforcement, investment planning, and performance monitoring.

The project's relevance is further reinforced by its close alignment with German development cooperation priorities. It operationalises BMZ's Water Strategy and the India Country Strategy by strengthening evidence-based and climate-resilient water governance, and it contributes concretely to the objectives articulated in the Ganga Narrative. In doing so, the intervention bridges strategic policy commitments with operational realities, translating high-level ambitions into tangible institutional and technical improvements within the water monitoring system.

The intervention is highly relevant for its primary intermediary target groups - namely water monitoring authorities, laboratories, and quality infrastructure institutions at central and state levels - whose capacities are critical for the effective functioning of the overall Ganga governance system. These actors form the backbone of regulatory oversight and environmental compliance, yet have historically

faced uneven capacities and fragmented standards. While the relevance for the final population living in the Ganga basin is necessarily indirect, the project's focus on improving data credibility and comparability constitutes a necessary precondition for achieving tangible environmental, health, and livelihood benefits over time. The design has also demonstrated a high degree of adaptability, responding to changing contextual conditions through geographic expansion within Uttar Pradesh, adjustments to partner needs, and the increased use of digital and blended capacity development formats without diluting technical depth.

Overall the criterion received the mark: 1.5 (very successful).

Coherence

Internally, the project is well embedded within the framework of German Development Cooperation in India and demonstrates strong complementarity with other technical cooperation modules, particularly GIZ-supported initiatives such as **Support to Ganga Rejuvenation III** and **SuWaVi**. The division of labour between the different German actors is clear and largely functional: PTB focuses on quality infrastructure, metrology, and laboratory systems, while GIZ addresses regulatory frameworks, planning processes, and implementation support at basin and state levels. This differentiation reduces duplication, allows each organisation to build on its comparative advantage, and strengthens the overall coherence of the German contribution to the Ganga basin.

Externally, the project aligns well with the efforts of major development partners, most notably the World Bank. Complementarity is particularly evident in areas related to laboratory strengthening, environmental compliance monitoring, and the interface between laboratory-based analysis and real-time water quality monitoring systems. PTB's capacity development support enhances the effectiveness of large-scale investments financed by the World Bank and others by ensuring that monitoring data meet quality standards required for regulatory and policy use. While coordination mechanisms are in place and functioning, the evaluation identifies scope for further formalisation and more systematic engagement - especially with financial cooperation projects and additional donors - to maximise synergies, strengthen information flows, and reduce the risk of parallel or fragmented interventions.

Overall the criterion received the mark: 1.5 (very successful).

Effectiveness

The project has largely achieved its outcome-level objectives and is on track to meet remaining targets by the end of the implementation period. Key achievements include the development and implementation of six categories of national-level recommendations covering sampling procedures, analytical methods, working conditions (including gender-sensitive aspects), and data management practices. These recommendations have contributed to greater standardisation and consistency across laboratories and authorities involved in Ganga water quality monitoring.

Substantial progress has been made towards ISO/IEC 17025 accreditation, with 11 laboratories already compliant and further laboratories expected to follow within the project timeframe. Accreditation represents a significant institutional milestone, as it embeds quality assurance procedures within routine laboratory operations and enhances the legal and regulatory credibility of generated data. In parallel, the project delivered a comprehensive and well-targeted package of capacity development measures, including in-person trainings, webinars, workshops, and systematic laboratory assessments. These measures have strengthened technical competence, reinforced awareness of quality assurance requirements, and supported behavioural change at individual and organisational levels.

The project has also contributed to improved coordination and exchange among quality infrastructure institutions and water monitoring authorities, thereby strengthening institutional linkages that are essential for sustained quality assurance. Some indicators - particularly those relying on qualitative confirmation of improved decision-making - were found to be insufficiently SMART and limited in their ability to fully capture higher-level behavioural or institutional change. Nevertheless, when assessed holistically and triangulated across multiple data sources, progress towards the project's objectives is strong, credible, and well substantiated by evidence.

Overall the criterion received the mark: 1.8 (successful to very successful).

Efficiency

The project demonstrates high levels of both production and allocation efficiency. A lean project structure, combined with extensive in-kind contributions from NMCG and NPL and the strategic use of external expertise, enabled cost-effective implementation without compromising the quality, depth, or reach of technical support. The project made deliberate use of partner capacities and existing institutional structures, thereby avoiding unnecessary duplication of resources.

The increasing use of virtual and hybrid formats for capacity development further enhanced efficiency by reducing travel costs and administrative burdens while maintaining continuity of engagement. By September 2025, approximately 78 percent of the total budget had been spent, with remaining funds contractually committed. This spending pattern indicates sound financial planning, effective budget management, and a high degree of predictability in implementation. Overall, resources were used in a manner commensurate with the outputs delivered and the outcomes achieved.

Overall the criterion received the mark: 1.5 (very successful).

Impact (Higher-Level Development Results)

The project contributes indirectly to higher-level environmental and social impacts by strengthening the foundations for reliable, quality-assured water quality data in the Ganga basin. Such data are indispensable for identifying priority pollution sources, targeting investments, enforcing regulatory standards, and monitoring the effectiveness of pollution control measures under Namami Gange and related programmes. Improved data quality enhances transparency and credibility in decision-making processes and supports a more efficient and evidence-based use of public and donor funds.

Given the technical cooperation nature and scale of the intervention, direct attribution to measurable improvements in river water quality is neither feasible nor expected at this stage. The project's contribution is therefore best understood as enabling and catalytic: it creates the necessary conditions for impact by improving the quality of information on which larger regulatory and investment decisions depend, rather than delivering direct environmental outcomes itself.

Overall the criterion received the mark: 2 (successful).

Sustainability

The project has strengthened individual and organisational capacities, particularly through laboratory accreditation, improved quality management systems, and enhanced technical competences among laboratory staff. These achievements provide a solid basis for the continuation of benefits beyond the project period and for the gradual institutionalisation of quality assurance practices within partner organisations. Institutional anchoring through NMCG and strengthened linkages with national quality infrastructure institutions further enhance sustainability prospects.

At the same time, sustainability risks remain, notably those related to staff turnover in laboratories and monitoring agencies, especially among junior or contractual personnel. High turnover can undermine the long-term retention of skills and institutional memory if not addressed systematically. Continued technical support, the institutionalisation of Training-of-Trainers approaches, and closer integration of capacity development efforts into organisational structures and human resource strategies will be required to fully embed and maintain the practices introduced under the project.

Overall the criterion received the mark: 2 (successful).

3. Learning processes and experiences

The evaluation identifies several important learning processes and experiences that are relevant both for the current project and for future technical cooperation interventions in the water and environment sector. A key learning concerns the critical importance of hands-on, in-person laboratory training for achieving and sustaining ISO/IEC 17025 accreditation. While online and blended formats proved useful for knowledge dissemination and follow-up, practical on-site engagement - particularly during laboratory assessments, method validation exercises, and internal audits - was indispensable for translating standards into daily laboratory practice.

Another central learning relates to the value of close, continuous coordination with central partners, especially NMCG, as the nodal institution for Ganga governance. Regular interaction and joint problem-solving enabled timely adjustments to activities, strengthened ownership, and ensured that project outputs remained closely aligned with national priorities and operational realities at state level. The project also demonstrated that effective coordination between central authorities, state-level institutions, and quality infrastructure bodies such as NPL is essential for building a coherent and credible water quality monitoring system.

The combination of traditional capacity development approaches with digital learning platforms emerged as a further positive experience. Webinars, online courses, and the use of learning management systems helped extend reach, reduce costs, and provide continuity between in-person trainings. However, the evaluation underscores that digital tools are most effective when embedded within a broader, practice-oriented capacity development strategy rather than used as stand-alone solutions.

Finally, the project highlights the need to address institutional risks more systematically, particularly those related to staff turnover in laboratories and monitoring agencies. High reliance on junior or contractual staff can undermine the long-term retention of skills. This points to the importance of Training-of-Trainers models, stronger organisational anchoring of competencies, and closer integration of capacity development efforts into institutional human resource strategies. These lessons are directly relevant for the design of a potential follow-on phase and for similar quality infrastructure projects in other river basins.

Criterion	Evaluation of the criterion
1. Relevance	1.5
2. Coherence	1.5
3. Effectiveness	1.8
4. Efficiency	1.5
5. Impact	2
6. Sustainability	2
Global assessment	**1.7**

Overall, the project received the mark: 1.7

4. Recommendations

Recommendations to Partners *(NMCG, CPCB, SPCBs, NPL)*

- **Empower State-Level Entities:** Strengthen institutional capacity of SMCGs and SPCBs through targeted technical assistance, dedicated state coordination cells, and integration of water quality monitoring responsibilities into state budgets. Develop state-level implementation roadmaps aligned with the national water quality monitoring strategy.
- **Expand the Scope:** Gradually expand project activities (lab assessments, trainings, and equipment provision) to cover all five basin states under a uniform framework. Align expansion with river basin–based coordination mechanisms and incorporate state-specific challenges (e.g., arsenic in Bihar, industrial pollution in UP, sediment load in Uttarakhand).
- **Scale Training:** Conduct Training-of-Trainers (ToT) programmes for all laboratories supported by PTB, ensuring that each state develops a pool of certified trainers. Engage with other training institutions (CPCB Academy, National Environmental Engineering Research Institute, NEERI) to build an inter-institutional knowledge base. Incorporate digital learning modules for continuous professional development.

- **Ensure Ongoing Quality:** Implement regular laboratory quality assessments at least once every 12 months, with mandatory follow-up visits for labs receiving corrective action notes. Develop a Quality Improvement Dashboard to track compliance and improvement trends across all labs.
- **Focus on a Pilot Area:** Implement a comprehensive pilot on the Ramganga river stretch covering: (a) enhanced monitoring; (b) integration of pollution abatement and enforcement actions; and (c) evaluation of public disclosure and citizen engagement mechanisms. Document learnings to replicate across other sub-basins.
- **Maximize Utilization of the Moodle Platform:** NMCG should be **actively involved by PTB in managing the new Moodle platform** as the official, mandatory system for continuous professional development for all water quality monitoring staff, ensuring sufficient budget allocation for licensing and content management in future phases.

Recommendations to Project Team

- **Maintain the Core Partnership:** Continue with NMCG and NPL as the primary implementing and technical partners to ensure coherence in project governance, knowledge management, and quality control. Establish a joint review mechanism (biannual) for strategic alignment and to monitor deliverables across project phases.
- **Adopt a Hybrid Training Approach:** Institutionalise a hybrid training framework combining on-site technical lab assessments and practical demonstrations with virtual capacity-building modules. Mobilise international experts and leverage digital platforms (e.g., e-learning portals, webinars) to enhance reach and standardisation. Integrate a post-training evaluation system to measure skill retention and practical application.
- **Engage Actively at the State Level:** Ensure regular participation in State Ganga Councils and related coordination platforms to track project progress, share updates, and gather state-specific feedback. Designate nodal representatives for each basin state to sustain engagement, supported by facilitation from NMCG. Produce state-specific engagement briefs summarising key updates and technical recommendations.
- **Enhance Internal Communication:** Formalise coordination mechanisms between the project and other TC modules through joint meetings, shared workplans, and communication templates. Develop a unified internal newsletter or dashboard summarising activities, milestones, and lessons learned across all related projects. Encourage cross-module technical exchanges and periodic learning events.
- **Increase Visibility and Knowledge Exchange:** Develop a strategic communication plan to present project achievements at key national and international forums (IEWP, India Water Week, Stockholm World Water Week). Create concise knowledge products - fact sheets, case studies, infographics - and disseminate them through both Indian and global knowledge-exchange platforms. Integrate visibility targets into the project's annual work plan.

Recommendations to the International Cooperation Department

Strengthen Inter-Module Cooperation Requirements: Formally mandate and establish **clear working and communication processes** (including joint meetings and reporting on synergies) between all co-located PTB and GIZ modules (e.g., Ganga II, SGR III, SuWaVi) to maximize coherence and reduce overlap.

Recommendations to the evaluation unit of Working Group Q.01

For small TC projects, revise the efficiency criterion to place greater weight on allocation efficiency (leverage of external/ partner resources) and cost-efficiency in delivery (use of virtual formats) relative to total budget expenditure.

Standardize data requirements for efficiency assessment: Since it is very difficult, if not impossible, to assess the monetary value of the impacts of a technical cooperation project that is essentially implementing capacity development measures in the quality infrastructure sector, the evaluation of its efficiency should focus on the generic appraisal of the production and the allocation efficiency. This should also include a breakdown of costs per output and a comparison of the planned budget with the budget actually spent.

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