Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

INTERNATIONAL COOPERATION

External evaluation

Key evaluator: Annette Schmidt

Technical evaluator: Yohanes Susanto Ridwan

Strengthening Quality Infrastructure Services for Environmental and Climate Monitoring

Country | Region:	Indonesia
Project number:	2019.2114.7
Project term:	03/2022 - 02/2026
Lead executing agency:	Badan Standardisasi Nasional (National Standardization Agency of Indonesia) (BSN)
Executing agencies:	National Metrology Institute (SNSU), National Accreditation Body (KAN), Standards Implementation Unit, Standards Development Unit, Human Resources Development Unit
PTB | Section:	Q.32
PTB | Project Coordinator:	Jana Körner
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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.

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List of abbreviations

BMKG	Indonesian Agency for Meteorological, Climatological and Geophysics
BMZ	Federal Ministry for Economic Cooperation and Development
BRIN	National Agency for Research and Innovation
BSN	Badan Standardisasi Nasional- National Standardization Agency of Indonesia
CESS UNPAD	Center for Environment and Sustainability Science of the University Padjadjaran
CRM	Certified Reference Material
GHG	Greenhouse gas
ILC	Interlaboratory Comparison
KAN	National Accreditation Body
LIPI	Lembaga Ilmu Pengetahuan Indonesia-Indonesian Institute of Sciences
MoE	Ministry of Environment
MoI	Ministry of Industry
MoPW	Ministry of Public Works
OECD-DAC	Organisation for Economic Co-operation and Development-Development Assistance Committee
PT	Proficiency Testing
QC	Quality Control
QI	Quality Infrastructure
RPJMN	National Medium-Term Development Plan
SDG	Sustainable Development Goal
SNI	Indonesian National Standards
SME	Small and Medium Sized Enterprise
SNSU-BSN	Standar Nasional Satuan Ukuran-Badan Standardisasi Nasional as National Metrology Institute of Indonesia

1. Summary

The subject of this evaluation was the project “Strengthening Quality Infrastructure Services for Environmental and Climate Monitoring in Indonesia (ECMI)”, which ran for four years (03/2022–02/2026) with a budget of EUR 1.5 million. The project’s political partner was the National Standardization Agency of Indonesia (BSN). Implementation involved the National Measurement Standards (SNSU) as National Metrology Institute of Indonesia, the National Accreditation Body (KAN), the Standards Implementation Unit, the Standards Development Unit, the Human Resources Development Unit, as well as a range of testing and calibration laboratories and private companies. Its primary objective was to enhance both the availability and use of quality infrastructure services in environmental protection and climate monitoring, with particular emphasis on water and air analysis.

Indonesia faces significant environmental and climate challenges driven by rapid economic growth, urbanisation, and industrial development. Water pollution, untreated wastewater, air emissions, and rising greenhouse gas emissions are key concerns. The government had set ambitious commitments through the Sustainable Development Goals (SDG), the National Medium-Term Development Plan (2020–2024), and climate strategies, highlighting the critical importance of reliable environmental monitoring for informed policymaking and regulatory enforcement.

The project was implemented within Indonesia’s well-established national Quality Infrastructure (QI) system. The BSN brings together the core QI components—metrology, standardisation, accreditation, and parts of conformity assessment—under a single institutional umbrella.

The environmental and climate monitoring sector involves a wide range of actors, including line ministries, subordinate regulatory authorities, specialised public institutions, and both public and private laboratories. While this landscape offers considerable potential for collaboration, it is also highly fragmented, with limited systematic exchange between supply-side QI institutions and demand-side actors, particularly in industry. As anticipated in the project design, this has resulted in a largely supply-driven QI system, where the mere availability of services does not automatically translate into sustained or systematic use.

Assessment according to the OECD DAC criteria

Criterion	Evaluation of the criterion
1. Relevance	1.8
2. Coherence	1.5
3. Effectiveness	2.3
4. Efficiency	2.5
5. Impact	1.5
6. Sustainability	2
Global assessment	**1,9**

No downgrading of the global assessment.

Relevance	The project was strongly aligned with both Indonesia's national strategies and BMZ's strategic framework. It was generally responsive to the needs of its key target groups—namely Quality Infrastructure (QI) institutions, laboratories, and, to a somewhat lesser extent, private sector companies. While the overall project design was sound and well-conceived, it was also highly ambitious in scope. The selected indicators were suitable for measuring progress towards the intended objectives. Moreover, the project demonstrated a notable ability to respond flexibly and strategically to a range of external developments, continuously adjusting its implementation approach as needed. Mark:1.8
Coherence	The project maintained very close cooperation with the project in the solar sector also carried out by PTB. However, synergies with the Global Project Quality Infrastructure (GPQI) implemented by GIZ remained limited. Overall, the project was well aligned with the partners' own initiatives and ongoing efforts. At the same time, there was little evidence of systematic cooperation or coordination with other donor-supported activities. Mark: 1.5
Effectiveness	The project strengthened the supply side of the QI system, particularly in water and wastewater analysis. On the demand side, activities were relevant but did not result in measurable company uptake within the project period, while progress in the gas sector remained below initial expectations. Mark: 2.3
Efficiency	The project managed its financial resources effectively and did not encounter any major delays. The same outputs and outcomes could not have been achieved with fewer resources. However, there is credible potential that even greater results might have been realised through stronger engagement in the gas sector, as originally envisaged. Mark: 2.5
Impact	Although data to measure the project's impact remains limited, it can reasonably be assumed that, through its improvements in environmental monitoring, the project has made a plausible contribution primarily to SDG 6 on the sustainable management of water, and to a lesser extent to SDG 13 to combat climate change. Mark: 1.5
Sustainability	The intervention shows a good degree of sustainability. Core QI services are institutionally embedded and supported by regulatory demand, providing a solid basis for continuation. While financial and regional capacity risks persist and documented company-level uptake remains limited, these risks do not fundamentally undermine the continuation of established services. Ongoing sludge-related standard development under BSN, offers a structurally anchored pathway for the gradual strengthening of demand over time. Mark: 2

2. Introduction

Subject of the evaluation

Project title	Strengthening Quality Infrastructure Services for Environmental and Climate Monitoring in Indonesia (ECMI)
Programme	Not applicable
Project objective	The availability and use of quality infrastructure services in the areas of environmental protection and climate monitoring, especially in water and air analysis, have increased
Term	03/2022 - 02/2026
Volume	1.500.000 EUR
Evaluation period	08/2025 - 02/2026

The evaluation of the project was conducted in three phases. During the initial phase, the evaluation team familiarised itself with the project, prepared the inception report, and conducted virtual interviews with key resource persons who could not be met in person. The field phase took place from 24 to 28 November 2025 in Jakarta, Serpong and Bandung. This was followed by the analysis phase, during which the collected data were assessed, and the evaluation report was drafted. The evaluation process will conclude with the presentation of the results at PTB, which is expected to take place in March 2026.

The evaluation team consisted of Annette Schmidt (Key Evaluator) and Yohanes Susanto Ridwan (Technical Evaluator). The evaluation primarily focused on assessing the extent to which the project objectives were achieved and on the generation of impact. In addition to effectiveness and impact, further evaluation criteria of the Development Assistance Committee (DAC) of the Organisation for Economic Co-operation and Development (OECD) were applied, including relevance, coherence, efficiency, and sustainability.

The assessment covered the project design and results logic, the monitoring system, as well as project management, coordination, and governance structures. Furthermore, the five success factors of the Capacity WORKS management model were analysed: strategy, cooperation, steering structure, processes, learning and innovation.

In addition, the project coordinator defined three evaluation questions of particular relevance to PTB:

1. How did the project strategically support the National Standardization Agency of Indonesia (BSN) in terms of enhancing cooperation and capacity development?
2. How did the project deal with the changing framework conditions of German Cooperation?
3. Which good practices from this project can be applied for a new project?

The primary users of the evaluation are PTB staff and project counterparts, as well as the German Federal Ministry for Economic Cooperation and Development (BMZ). As the evaluation will be published on the PTB website, the results will also be accessible to interested members of the public.

3. Framework conditions and strategic approach of the project

3.1 Framework conditions

At the time the ECMI project started, Indonesia faced significant environmental and climate-related challenges linked to rapid economic growth, urbanisation, and industrial development. Water pollution, untreated wastewater, air emissions, and increasing greenhouse gas (GHG) emissions were identified as major policy concerns, and the Indonesian Government had articulated ambitious national and international commitments, including the Sustainable Development Goals (SDGs), the National Medium-Term Development Plan (RPJMN 2020–2024), and climate-related strategies. Within this context, reliable environmental and climate monitoring was recognised as a critical prerequisite for evidence-based policymaking, regulatory enforcement, and environmental protection.

Political and institutional framework

The project was implemented within a comparatively well-established national Quality Infrastructure (QI) system. The BSN, reporting directly to the President, brings together the core QI components—metrology, standardisation, accreditation, and parts of conformity assessment—under one institutional umbrella. BSN's standards development function operates within a well-defined regulatory framework: Government Regulation No. 34/2018 on the National Standardisation and Conformity Assessment System and BSN Regulation No. 8/2022 on SNI Development Procedures. Under this framework, BSN formulates Indonesian National Standards (SNI) through a structured multi-stakeholder process encompassing programme registration, technical committee deliberation, public enquiry, consensus, and formal adoption, aligned with Indonesia's obligations under Article 2.4 of the World Trade Organisation (WTO) Agreement on Technical Barriers to Trade, which requires the use of relevant international standards (ISO/IEC) as the basis for technical regulations. A key framework condition at project start was the recent integration of the National Measurement Standards (SNSU) as National Metrology Institute into BSN following its separation from the former research institute - Indonesian Institute of Sciences (LIPI). While this institutional consolidation offered long-term potential for efficiency and systemic coordination, it also created short- to medium-term challenges, including the need to rebuild laboratory infrastructure, develop staff capacities, and redefine institutional roles.

In the environmental and climate monitoring sector, multiple public actors were involved, including line ministries (especially Environment and Forestry and Industry), subordinate regulatory authorities, specialised public institutions such as the Indonesian Agency for Meteorological, Climatological and Geophysics (BMKG), and a wide range of public and private testing laboratories at national and regional levels. While this landscape offered considerable potential for cooperation, it was also characterised by fragmentation and limited systematic exchange between supply-side QI institutions and demand-side actors, particularly industry. As anticipated in the project proposal, this institutional constellation resulted in a predominantly supply-driven QI system, in which the availability of services did not automatically translate into sustained and systematic use.

Regulatory and sector-related framework conditions

At project start, the regulatory framework for water and wastewater monitoring was relatively mature. Environmental regulations and compliance requirements generated continuous demand for testing, proficiency testing (PT), and certified reference materials (CRM), particularly in wastewater management and selected industrial sectors, such as textiles. These conditions constituted a strong

enabling framework and aligned well with the project's focus on strengthening QI services in water analysis, as outlined in the project design.

The other area in which the project wanted to take action was the gas sector. As in the water sector, this area is also anchored in national strategies. However, compared to the water sector, the corresponding institutional capacities and demand structures were less developed, and the regulatory relevance was expressed to a lesser extent in consistent operational demand for gas-related QI services.

Socio-economic and cultural conditions

From a socio-economic perspective, the project operated in an environment where many industrial actors, especially small and medium sized enterprises (SMEs), had limited awareness of the strategic value of QI services beyond regulatory compliance, as many of them struggle to comply with existing environmental regulations, with some even lacking basic compliance facilities.

While the proposal assumed that improved information, dialogue, and pilot interventions could stimulate demand, industry engagement proved more challenging than expected. Encouraging companies to participate was a challenge, partly due to limited incentives, resource constraints, and trust issues in interactions with regulatory authorities. Two larger companies finally agreed to join, and in mid-2025 an industrial park was added, but the processes there are still in their infancy.

Furthermore, quality management and the proactive use of QI services for process optimisation have not yet been achieved. Behavioural and cultural context constrained the uptake of project-supported services and helps explain why demand-side results, particularly under Output 3, remained limited despite targeted interventions. At the same time challenging issues such as sludge management, which was initially motivated by companies' interest in meeting future ECOLABEL requirements—also limited the extent to which company-level use of QI services could realistically be achieved within the project period. This issue found to be policy-driven and structurally complex, as translating sludge management challenges into formal standards depends primarily on multi-actor processes led by national standardisation and environmental authorities rather than on direct company-level decision-making, with companies acting mainly as indirect stakeholders in the standard-setting process.

Changes during implementation and project response

During the implementation period, several framework conditions evolved. The COVID-19 pandemic initially caused delays and required temporary adjustments to implementation modalities, including the use of virtual and hybrid formats. As conditions improved, most training and workshop activities were subsequently implemented on-site, allowing for direct technical exchange and hands-on engagement with national and international experts.

At the same time, policy discussions increasingly addressed topics such as circular economy, as well as more technical and operational aspects related to sludge management and climate-related monitoring. These developments shaped the broader implementation context and influenced stakeholder priorities during the project period.

3.2 Strategic approach of the intervention

The following section presents the theory of change, i.e. the strategy through which the project sought to achieve its objectives. The numbering corresponds to the results model, the graphical representation of the theory of change, which is provided in Annex 2. The model was developed jointly by the project coordination team and the evaluation team, building on the existing results model.

Output 1: To strengthen the capacities of BSN to ensure traceability and dissemination of environmental and climate management (output), BSN employees received further training with a strong application orientation (O1-1/ Ind. 1.2). At the same time, BSN was supported in defining its role as a national metrology institute (O1-2), and cooperation between metrology, accreditation and national reference laboratories and environmental laboratories was strengthened, e.g. through the Young Talent programme (O1-4/ O2-1). The hypothesis was that this would enable BSN to permanently offer central QI services (O1-6/ O1-7/ MoI. 1) that are demand-oriented (O1-3) and can be marketed profitably (O1-5). This led to an increase in the availability and use of QI services in the areas of environmental and climate monitoring, especially regarding air and water analytics (outcome).

Output 2: To strengthen the capacities of testing and calibration laboratories to provide services in water and air analysis (output), the employees of these laboratories received training with a strong application orientation (O2-2 / Ind. 2.2). The hypothesis was that participation in PT and inter-laboratory comparisons (ILC) would improve external quality assurance (O2-3), additional PT providers would enter the market (O2-4/ Ind. 2.1), and testing and calibration laboratories would offer additional services such as PTs and services for textile and other sectors' wastewater) (O2-5/ MoI. 2). This contributes to a better availability of these services (outcome).

Output 3: To improve the capacities of selected industries and enable them to comply with environmental and climate requirements on a pilot basis (output), the key QI service needs of textile industries in Bandung were identified in a first step (O3-1). Furthermore, multi-disciplinary solutions to wastewater (sludge) treatment were identified and introduced by a think tank (O3-2). The textile companies participated in training courses and thus improved their knowledge about operational environmental management (O3-3/ Ind. 3.1). The hypothesis was that these activities would enable them to develop QI strategies that aim to ensure compliance with environmental and climate-related requirements (O3-4/ Ind. 3.2), increase their commitment to standardisation processes (O3-5) and show an interest in using climate- and environment-related QI services (O3-6/ MoI. 3), whose availability is ensured by activities on the supply side (Outputs 1 and 2) (outcome).

Output 4: To increase the awareness of selected industries and political decision-makers of the relevance of QI services for reliable environmental and climate monitoring (output), regular exchanges between government, business and BSN were organised by BSN (O4-1/ Ind. 4.1). The hypothesis was that all QI components united in the BSN improved their cooperation and industry engagement (O4-2/ Ind. 4.2), that this would raise awareness on the part of QI users (O4-3) and that the relevance of QI would be recognised by decision-makers in public institutions and the private sector (O4-4), leading to higher demand, which is given by the activities on the demand side (outcome).

4. Evaluation methodology

4.1. Evaluation design

This evaluation employed a mix of quantitative and qualitative social science methods, adapted to the purpose of the assessment. The OECD-DAC criteria of relevance, coherence, and sustainability were analysed using the analytical questions defined by PTB; no specific evaluation design was applied for these criteria. The same approach was used for the criterion of efficiency; however, in this case the analysis was based on the allocation of costs to outputs and cost categories.

With regard to effectiveness and impact, there are in principle two approaches to measuring project results: a theory-based approach and an experimental approach. In consultation with the PTB evaluation department, the evaluation followed a theory-based approach rather than an experimental approach such as a randomised controlled trial (RCT). The reason for this is that an RCT would have been far too time-consuming and would have required a longer lead time without producing more valid results. Contribution analysis was applied, as a theory-based approach, to assess the extent to which the observed results can be attributed to the project. In a first step, all relevant results were systematically documented. In a second step, the causal links between project interventions and observed results were examined in order to distinguish the project's contribution from other potential influencing factors, such as interventions by other donors. Where direct attribution was not possible, the project's contribution was plausibly justified.

Demonstrating a credible contribution required the collection of sufficient evidence and the use of methodological and data triangulation to establish that the observed results were most likely attributable to, or constituted a meaningful contribution of, the project. The analysis was grounded in the project's results logic—the theory of change—which formulates the hypotheses and cause-and-effect relationships developed in the previous chapter. These hypotheses were tested and assessed as part of the evaluation.

In Chapters 5.1.3 (Effectiveness) and 5.1.5 (Impact), the contribution story[1] presents the observed changes and the project's contribution to these results, based on robust, transparent, and credible evidence.

In addition, the evaluation team was given the supplementary questions already mentioned in Chapter 2 and which will be presented in detail in Chapter 6.

4.2. Data sources; data quality

Document and quantitative data analysis

The document review enabled the evaluation team to understand both the national contexts and the specific institutional settings in which project support was provided. To this end, the evaluators reviewed key project documents, including the technical proposal, planning and operational documents, the operational plan, monitoring and financial documents, progress reports, project presentations, and the self-assessment of the Capacity WORKS-instrument on which the PTB management model is based.

[1] The contribution story explains why it can reasonably be assumed that the project contributed to the observed results and how this contribution occurred.

Key informant interviews

A total of 60 individuals (33 women) were interviewed through virtual and in-person interviews conducted in Jakarta, Serpong, and Bandung. The interviews followed a semi-structured interview guide (see Annex 5) based on the OECD-DAC evaluation criteria and the Capacity WORKS success factors. Interviewees were selected based on their level and type of involvement in the project: the evaluation team proposed potential interviewees, and the project coordination team subsequently facilitated contact with the respective individuals and organised the agenda.

Representatives of the following stakeholder groups were interviewed: national QI institutions (accreditation, standardization, and metrology bodies), testing laboratories, PT providers, users of QI services (companies), PTB representatives, PTB technical experts, representatives of international cooperation, research institutions, and downstream offices of relevant ministries.

At the request of the evaluation team, no PTB representatives were present during the interviews in order to ensure an impartial and open interview environment.

To protect interviewees, the evaluation does not attribute statements to individual respondents by name.

Final workshop

Following the completion of the in-country evaluation phase, the evaluation team presented the preliminary findings and discussed the draft recommendations in an online workshop with 14 participants representing the project partners and PTB. The discussion generated valuable feedback, initiatives, and ideas, which provided additional input for the final report.

Data quality

All information and documentation requested by the evaluation team were made available promptly, with the exception of the monitoring document, which required substantial revision and was therefore only provided shortly before the in-country evaluation. Overall, the documentation was comprehensive, with detailed information available on all implemented activities and developed outputs.

A sufficient number of relevant and knowledgeable interviewees was available, covering the full range of perspectives required for the evaluation. Interviews were well prepared in advance, and a large proportion were conducted virtually prior to the key evaluator's travel to Indonesia.

The project coordination team prepared the evaluation very thoroughly. All interviews were conducted as scheduled, and ad hoc requests from the evaluation team for additional information were addressed immediately. The evaluation team expresses its sincere appreciation for this excellent cooperation.

5. Evaluation results

5.1 Status of the transformation process (OECD/DAC)

Marking scale for the evaluation of the OECD/DAC criteria

Evaluation	Grade	Description
very successful	1	very good result, far above expectations
Successful	2	good result, entirely meets expectations
successful to a limited extent	3	satisfactory; results are below expectations, but mainly positive
rather unsuccessful	4	unsatisfactory result; below expectations; negative results prevail despite several positive results
mainly unsuccessful	5	negative results clearly prevail despite several positive partial results
entirely unsuccessful	6	the project has failed completely; situation has rather deteriorated

5.1.1 Relevance

Dimension 1: To what extent is the intervention's design geared to country-specific, regional, and global policies and priorities of the partners and the BMZ?

In 2020, Indonesia presented its National Medium-Term Development Plan 2020–2024 (RPJMN). This comprehensive five-year plan outlines the country's national development strategy in key areas such as poverty reduction, human resource development, sustainable economic growth, green infrastructure, energy efficiency and digital transformation. It seeks to promote economic growth based on low greenhouse gas emissions and the prudent use of natural resources. Climate protection is identified as a national priority and is fully integrated throughout the document. The overarching objective is to transform Indonesia into a highly developed country while steering it towards a low-carbon development pathway. The RPJMN serves as a central roadmap for ministries, agencies and other stakeholders to ensure that economic development is both inclusive and sustainable. Environmental monitoring plays a significant role in the plan; for example, it addresses issues related to gas emissions as well as water management. These topics are also taken up in the current National Medium-Term Development Plan 2025–2029, which establishes national targets through indicators such as the "indeks kualitas air (water quality index)", "indeks kualitas udara (air quality index)", and the "persentase penurunan emisi gas rumah kaca (greenhouse gas emission reduction)". It also emphasizes the importance of "pengendalian dan evaluasi pelaksanaan RPJMN (control and evaluation of RPJMN implementation)" supported by integrated information systems, thereby implicitly requiring robust environmental and emissions monitoring capacities.

Indonesia regards the implementation of the SDGs as a strategic priority. The Ministry of National Development Planning (BAPPENAS) is responsible for the planning, coordination, implementation and monitoring of the SDGs. In this context, progress towards SDG 6.3, which focuses on improving water quality and reducing the discharge of hazardous substances, is closely monitored. The same applies to SDG 13.2, which aims to integrate climate change measures into national policies, strategies and planning. Both SDGs are of particular relevance to the project.

Overall, the project's objectives are therefore very well aligned with the partner country's priorities and policy framework, as well as the project's intervention design, which places the topics of water monitoring and gas monitoring at the centre of the project.

For BMZ, Indonesia, along with other emerging economies, is one of its Global Partners. These are partners with whom the BMZ works together on global challenges such as climate change. The ECMI project also fits into this framework, even though it was implemented as a stand-alone measure within the framework of the Green-Infrastructure-Initiative and was not embedded in a broader programme. The Green-Infrastructure-Initiative, agreed between Indonesia and Germany in 2019, aims to significantly reduce greenhouse gas emissions by preparing and financing climate-relevant ("green") urban infrastructure. Although the initiative is endowed with substantial financial resources, its implementation has repeatedly stalled, partly due to coordination challenges on the Indonesian side. In thematic terms, the project can be broadly assigned to the initiative's third field of action, "Wastewater and Water Management".

German development cooperation structures its work around five core areas. Originally, the project was classified under the area of intervention "Sustainable Urban Development" within the Core Area "Responsibility for our planet – climate and energy" (BMZ 2021: https://www.bmz.de/resource/blob/97122/bmz-core-area-strategy-climate-and-energy.pdf. At a later stage, it was reassigned to the area of interventions "Forests" under the Core Area "Conserving nature and natural resources, protecting life on Earth" (BMZ 2024: https://www.bmz.de/resource/blob/231054/strategy-conserving-nature-and-natural-resources-protecting-life-on-earth.pdf. According to several interview partners, this reclassification was difficult to understand and did not support the project; rather, it illustrates challenges within the BMZ in clearly positioning the project within its own portfolio.

Nevertheless, the project is closely aligned with the objectives of German development cooperation in Asia as outlined in the BMZ's country strategy for Indonesia: "Climate policy cooperation with Asia is described as the "DNA" of German development policy in the region" (BMZ-Länderstrategie für die bilaterale Entwicklungszusammenarbeit mit Indonesien 2024-2030 – BMZ 2024, p. 1). One of the five cornerstones of this German Development Policy with Asia (BMZ 2023: https://www.bmz.de/resource/blob/195430/german-development-policy-with-asia.pdf explicitly addresses the "Preservation of biodiversity and ecosystems and the prevention of resource conflicts", which includes issues such as water and air monitoring. The project is also broadly consistent with the country strategy for Indonesia adopted in 2024, which focuses on the two core themes of climate and natural resources, even though this strategy does not explicitly refer to water and air monitoring.

In conclusion, the project is very well aligned with Indonesia's national policies. It is also thematically embedded within the BMZ's strategic framework, even though the specific focus on quality infrastructure is not explicitly reflected in BMZ policy documents. The project is considered as successful "2" in this dimension.

Dimension 2: [2] To what extent is the intervention's design geared to the needs and capacities of the target groups?

[2] *The evaluation must clearly define the target group of the measure at the outset. In addition, it must be explained whether the measure relates or should relate to particularly vulnerable individuals, groups or organisations. According to this assessment, the second question of the dimension strong/weak/not should be*

The project was closely aligned with the needs of the indirect target group, namely the institutions SNSU, KAN, and the units standard implementation, standard development, and human resources. To address these needs, it offered a wide range of capacity-building activities, including training courses, exchanges, coaching, mentoring, and workshops. These measures were rated as highly effective by the participants. By way of example, only the following training sessions will be mentioned here: At SNSU, the water analysis of Inorganic Laboratory benefited most from the project's support, while the Gas Laboratory benefited to a lesser extent. In addition, the project continued its long-standing advisory services in the area of strategic development at SNSU, which proved particularly valuable for BSN management.

Another particularly noteworthy and needs-oriented consulting approach was the Young Talent Programme, developed in close cooperation with the human resources development department. Within this programme, BSN's junior staff participated in tailor-made workshops that applied innovative methods such as design thinking. The programme pursued two main objectives: first, to reduce the widespread silo mentality among the various BSN units, and second, to introduce young professionals to strategic thinking and innovative approaches in the field of QI. Special emphasis was placed on the distinction between government-driven regulation and industry-driven innovation, and on the tendency of many ministries, and in some cases BSN itself, to regulate and control processes comprehensively rather than relying on standards that emerge from customer requirements or tender specifications. Through small pilot activities, participants were also introduced to the specific QI needs of industries including small medium enterprises. While the programme primarily addressed the capacity-development needs of young employees, it will also support in the future a smooth generational transition at SNSU and was very well received overall.

With regard to the direct target group, namely users of QI services in the environmental sector such as testing laboratories, PT providers, laboratories under the Ministry of Environment (MoE) and the Ministry of Industry, as well as the Indonesian Agency for Meteorological, Climatological and Geophysics (BMKG), mentoring activities in gas and water testing capacities were also highly appreciated. PT providers in particular expressed strong interest in technical topics such as sample preparation, statistical evaluation, assigned values, and the provision of proficiency testing according to ISO/IEC 17043.

In addition, the project engaged around 20 textile companies in Bandung, most of them large enterprises, in discussions on sludge measurement and treatment in the context of ECOLABEL requirements. The sludge issue emerged as a shared concern among the participating companies and was directly linked to QI needs. Two companies voluntarily participated in pilot demonstration, and the resulting insights were shared with the broader group. The activities contributed to an ongoing standard development process on sludge classification and potential re-use. However, the initiative did not result in three companies documenting pilot use of climate- and environment-related QI services as required under Outcome Indicator 3. Reaching smaller companies remained challenging, despite broader demand-oriented efforts such as the Young Talent Programme.

In the medium to long term, the Indonesian population also benefited from the project, as improved measurement capacities contributed to enhanced environmental quality. Although direct effects on vulnerable groups could not be demonstrated, the fact that the project sought to promote more

included in the evaluation. In this respect, a human rights perspective should also be adopted here, which defines rights holders and duty bearers. Helpful documents: Gender & Safeguard System, Environmental and Social Impact Assessment, Integrated Peace and Conflict Analysis.

inclusive regional access to QI services, was a step in the right direction so that population groups in disadvantaged regions could also benefit from the effects of improved QI services.

In summary, the needs of the indirect target group were addressed very effectively, whereas company-level uptake of QI services remained limited. The services offered to companies were relevant from a QI perspective, particularly with regard to sludge-related services. Reaching smaller companies also remained challenging, despite efforts to engage SMEs and micro-SMEs.

The project is considered as successful “2” in this dimension.

Dimension 3: To what extent is the intervention’s design appropriately, realistically and plausibly geared towards achieving the intervention’s objective?

The project was structured around four outputs: two addressing the supply side and two focusing on the demand side. On the supply side, the project worked with its main partner, SNSU-BSN, as well as with selected laboratories, to expand and strengthen their service portfolios. On the demand side, it collaborated with companies in the textile sector to support the effective use of the newly developed QI services and placed particular emphasis on fostering cooperation between industry and political decision-makers. This approach is well suited to addressing both dimensions of the project objective, namely the availability and the use of QI services. Overall, the results hypotheses have proven to be plausible, and the project design can be considered appropriate and realistic from both a technical and financial perspective.

From an organisational point of view, the project operated in a highly complex institutional environment and sought to optimise its intervention within these constraints. Procedures turned out to be more complex and time-consuming than initially anticipated, particularly in the case of the sludge-related standard development process, which involves multiple stakeholders and regulatory considerations. As a result, the process is still ongoing and unlikely to be finalised within the project duration. This reflects the inherent institutional complexity of standardisation processes and was one of the factors contributing to the cost-neutral extension of the project by one year.

PTB and BSN–or more precisely metrology units of LIPI, from which parts of today’s SNSU emerged–have a long-standing cooperative relationship dating back to the 1990s. Institutional changes in 2019, in particular the establishment of the National Agency for Research and Innovation (BRIN) and the separation of SNSU metrology from LIPI and its assignment to BSN, further increased the need for strategic advisory support at BSN. This advisory support has primarily been provided by a consultant with long-standing and close ties to the Indonesian metrology system. The consulting covered issues such as how BSN could promote a shift from regulation-driven standards to an innovation-driven approach in order to support a modern economic policy, how it could strengthen its role as a national coordinating body for QI, and how it could expand its engagement in training activities.

To provide a more solid basis for this cooperation, a two-page “Orientation Framework for BSN–PTB Cooperation in Quality Infrastructure” was developed, while the formulation of a comprehensive cooperation strategy is still at a nascent stage. However, this strategic-level consulting was not reflected in either the project outputs or the indicators. As a consequence, its results could not be measured, no dedicated financial resources could be allocated to it, and it remained largely invisible to the BMZ, as progress reporting is primarily indicator based.

With regard to the selection of topics and regions, it should be noted that although the project was initially designed to cover both the gas and water sectors, in practice it focused predominantly on the

water sector. The explanation given by interview partners was that the gas sector at SNSU-BSN is less developed and therefore less receptive to PTB's advisory support. The evaluation team does not fully share this assessment and will return to this issue later in the report. The choice of the textile sector appears appropriate, both in view of the wastewater challenge and the sector's economic importance. On this basis, the PT parameters were defined. However, as already noted, the willingness of companies in the sector to engage in cooperation proved to be limited.

Bandung was selected as the focal location for cooperation with the textile industry due to its proximity to the Citarum River, a vital resource that is nevertheless notorious for severe pollution from industrial and domestic waste. This choice is therefore considered appropriate.

Regarding partner selection, it is positive that, alongside the very close cooperation with SNSU-BSN, the project also engaged with KAN, the Standardisation Implementation Unit, the Standard Development Unit, and the Human Resource Department. Only through such a broad partnership approach can QI-related interventions adequately respond to the needs of industry and other stakeholders.

The selection of companies has already been discussed in the previous evaluation dimension and is therefore not discussed further here.

Indonesia has more than 200 environmental laboratories spread across various regions. Laboratories in Surabaya were selected due to the high concentration of industrial activity and the large number of environmental testing laboratories located there. In addition, a laboratory in North Sumatera was included which, subject to achieving accreditation, would become the first laboratory in the province to offer PT. From the perspective of interviewees from the private sector, cooperation with the MoE could have been intensified.

The analysis of sludge produced unexpected results, indicating that it is less toxic than previously assumed and could, in principle, be used for other purposes, such as energy generation. However, realising such potential would require adjustments to existing standards by the MoE. While the ministry was involved from an early stage, these standardisation processes are inherently long-term and driven primarily by institutional actors, placing them beyond the scope of company-led results within the project period.

With regard to outcome indicators, these were generally suitable for measuring the intended objectives. The same applied to the output indicators. But Outcome Indicator 3 and the Output Indicators 3.1 and 3.2 focused very strongly on QI aspects, whereas the corresponding output was formulated in much broader terms. In practice, this created challenges, as the project initially offered very open-ended support as requested by the Output 3, but not in line with the indicators, which ultimately led to this focus on sludge-related issues. Output Indicator 3.2, however, measured the development of a QI strategy by companies, an aspect with which the interviewed companies were largely unfamiliar, and which bore little relation to the advisory services actually provided. The same held true for Output Indicator 3 and Outcome Indicator 3 (see also further explanation in the chapter effectiveness).

The project design followed a holistic approach to sustainable development. In social terms, it brought together and interconnected a wide range of stakeholders. The economic dimension was addressed through support to a highly relevant industry with the potential to generate employment and tax revenues. Finally, the environmental dimension was strongly reflected in the project's aim to create

conditions for monitoring natural resources such as water and air, thereby helping to prevent emissions from industrial wastewater and exhaust gases.

In conclusion, the project design was generally well suited to achieving its stated objectives. It should be noted, however, that despite the high relevance of the strategic advisory component, this dimension was not adequately reflected in the formal project design. Accordingly, the project is considered as successful “2” in this dimension.

Dimension 4: To what extent has the intervention’s design responded to changes in the environment and adapted to the needs?

The project had to navigate a considerable number of changes, aptly described by one interviewee as “a history of mutual navigation through turbulent times”. On the partner side, these included the previously mentioned institutional changes and ongoing restructuring processes, which were accompanied by frequent staff turnover and a reduction in the number of laboratories. In addition, a planned project component could not be implemented as foreseen. This was the Environmental Early Warning System for the detection of slowly developing environmental disasters, which was initially to be implemented by this project, later by GIZ, and ultimately not even advised by the German side. As a result, the anticipated funding of EUR 0.5 million was not disbursed. Similarly, although the project originally envisaged a strategic linkage with the Green-Infrastructure-Initiative implemented by GIZ and KfW, suitable opportunities for cooperation did not materialise. In response, the project adjusted its planning and aligned its activities more closely with the evolving needs of its partner.

The previously mentioned change in allocation between the two BMZ core areas was also relevant in this context. The follow-up project will focus on the circular economy and the potential contribution of QI, thereby returning to the area of intervention “Sustainable Urban Development”. The project has already made effective use of the available time and networks to explore this thematic field, establishing contacts with potential laboratories and the relevant sector network. In doing so, it laid important groundwork for the subsequent project phase.

With regard to the evaluation dimension “response to changes in the environment”, the project performs very well and is therefore rated as highly successful “1”. It demonstrated a strong capacity to respond flexibly and thoughtfully to numerous external changes and continuously adapted its implementation approach accordingly.

Summarized evaluation

Criterion	Evaluation dimension	Weighting	Appraisal
Relevance	The intervention’s design is geared to country-specific, regional and global policies and priorities of the partners and the BMZ.	25 %	2
	The intervention’s design is geared towards the needs and capacities of the target groups	25 %	2

	The intervention's design is realistically and plausibly geared towards achieving the intervention's objective	25 %	2
	The intervention's design has responded to changes in the environment and adapted to the needs.	25 %	1
Global assessment of the relevance			1.8

5.1.2 Coherence

Dimension 1: Internal coherence: Within German development cooperation, to what extent was the intervention designed and implemented in a complementary manner, based on a division of tasks?

As already noted, this project is a stand-alone intervention and not part of a broader programme. PTB is, however, implementing another project in Indonesia entitled "Improvement of Quality Infrastructure Services for the Solar Sector II" (05/2025–04/2028). There was a very close and productive exchange between the ECMI project, this project and also with its predecessor, "Strengthening Quality Infrastructure for the Photovoltaic Sector" (11/2020–05/2025). Notably, the two Indonesian staff members are involved in both projects. The creation of synergies has been possible, for example through the joint organisation of events with BSN and the mutual invitation of partners to training activities. One example is a training course on measurement uncertainty organised by the photovoltaic project in 2023, which was also attended by partners from the ECMI project.

Particularly noteworthy is the cooperation within the framework of the Young Talents Programme. As described earlier, the Young Talents were supported in developing pilot projects tailored to the needs of companies. This process also led to the development of a project in the field of battery storage, which is now being taken forward under the photovoltaic project.

The project progress reports mention two regional projects. One is "Strengthening the Quality Infrastructure in ASEAN", which has its headquarters in Jakarta, the other is the project, "Developing the Foundations for a Digital Measurement Infrastructure in BMZ Partner Countries". In both BSN is only involved to a very limited extent: (i) SNSU-BSN carried out a training in frame of the ASEAN Food Testing Laboratory Committee (AFTLC) component of the project, and (ii) BSN representative participated in the working group on Digital Calibration Certificates, but no further cooperation took place.

GIZ is also active in Indonesia through its "Global Project Quality Infrastructure" (GPQI), financed by the German Federal Ministry for Economic Affairs and Energy (BMWE). Despite thematic similarities and some shared partners, overlap between the two projects remains limited. GPQI focuses primarily on the policy dimension of quality infrastructure, particularly issues related to trade barriers and legal metrology, whereas PTB operated mainly at the technical implementation level. Nevertheless, PTB has supported GPQI on several occasions by providing expert speakers for events. Looking ahead, the planned follow-up project on the circular economy will be embedded in a programme context and is expected to coordinate more closely with GIZ; this coordination process has already been initiated.

There are no points of cooperation with KfW Development Bank or the Federal Institute for Geosciences and Natural Resource (BGR).

Overall, the project has made very good use of the limited opportunities available for cooperation. This evaluation dimension is therefore rated as very successful “1”.

Dimension 2: External coherence: To what extent does the intervention’s design and implementation complement the partner's own efforts and is coordinated with other donors’ activities?

The project supported the efforts of both the indirect and the direct target groups. With regard to the indirect target group, one example was the SNSU’s initiative in cooperation with BMKG, to establish the development of GHG CRM. This project supported this initiative by providing gas cylinders, providing the traceable Gas CRM from National Metrology Institute, and facilitating expert training at PTB, Germany. While the CRMs are not yet available on the market, the initiative shows clear progress, and the key prerequisites for CRM production are now in place. Similarly, the project contributed to the Young Talent Programme for approximately 160 BSN employees. While the project financed various workshops, BSN itself covered the costs of a boot camp in which young talents received intensive coaching and engaged with around 200 SMEs to jointly identify the standards and testing needs that these companies actually require as well as the gap implementation standard analysis for further program of SMEs technical assistance. The entire process was closely managed and implemented with a high level of commitment and ownership by BSN’s human resource department.

With regard to the direct target group, namely the users of the QI, the project was likewise aligned with the needs of its partners. Laboratories required PT to support their further development, and the project provided advisory support in this area, e.g. training and mentoring support to BBSPJPPI Semarang and BSPJI Medan to provide PT on wastewater. In the textile sector, the activities on sludge-related testing and standard development were aligned with existing ECOLABEL requirements and ongoing regulatory frameworks.

The project made use of the partners’ existing facilities, such as laboratories and the BSN sub-office in Bandung to conduct the training activities. SNSU-BSN was closely involved in selecting laboratories to receive PT support and participated throughout the entire process with its own laboratory.

Regarding cooperation with other donors, the project proposal originally envisaged collaboration with the United Nations Industrial Development Organization (UNIDO). UNIDO supported BSN under the Global Programme for Quality and Standards (GQSP), financed by Swiss Development Cooperation. Through GQSP, BSN received support in building metrological capacities in microbiology and in revising relevant standards to improve value chain quality in the fisheries sector. In addition, GQSP promoted awareness among users and policymakers of the importance of QI in this sector. Its activities were not limited to fisheries, as GQSP also supported BSN in developing a national quality policy. However, the planned synergies could not be realised. Only recently, in the course of planning for the new project, has contact with UNIDO been re-established, as the organization is now active in the field of the circular economy. However, the prospects for future cooperation remain uncertain due to significant funding cuts affecting UNIDO.

No additional cooperation with other donors emerged.

In summary, the project was closely aligned with the partners' own initiatives. The absence of cooperation with UNIDO, despite this being envisaged in the project proposal, is viewed critically. Overall, the project is considered as successful "2" in this dimension.

Summarized evaluation

Criterion	Evaluation dimension	Weighting	Appraisal
Coherence	Internal coherence: Within German development cooperation, the intervention was designed and implemented in a complementary manner, based on the division of tasks.	50 %	1
	External coherence: The intervention's design and implementation complement the partner's own efforts and are coordinated with other donors' activities.	50 %	2
Global assessment of the coherence			1.5

5.1.3 Effectiveness

Dimension 1: To what extent has the intervention achieved its objective (at outcome level) according to the indicators agreed upon?

The objective of the project was: "The availability and use of quality infrastructure services in the areas of environmental protection and climate monitoring, in particular water and air analysis, have increased". The project has clearly achieved its objective on the supply side. This is evidenced by the table, which shows that Outcome Indicators 1 and 2—both related to availability—have been achieved or even exceeded. In contrast, performance on the demand side, i.e. the aspect of use, has been weaker. The corresponding Outcome Indicator 3 has not been fully achieved, and the evaluation team does not expect it to be met within the remaining project period.

Outcome indicator	Degree of fulfilment (in %)	Appraisal (A-C)*	Justification Evidence
1. *The National Metrology Institute (Standard Nasional Satuan Ukuran SNSU-BSN) offers three additional internationally recognizable services (e.g. interlaboratory tests, reference materials) in the areas of air and water analysis* Initial value: 4	133	A	Evidence collected through interviews and field visits confirms that SNSU-BSN has delivered four metrological services against a target of three, corresponding to an achievement level of 133%. The services provided include: (i) PT on heavy

Target value: 7 Current value (December/2025): 8			metals in wastewater (not yet peer reviewed), (ii) provision of assigned values for PT providers, (iii) provision of CRM for heavy metals in wastewater, and (iv) PT on multicomponent gas emissions (CO_2 and CO in nitrogen), not yet peer reviewed.
2. *Four testing or calibration laboratories in the regions covered by the module each offer 2 additional internationally recognizable services in air and water analysis.* Initial value: 14 Target value: 22 Current value (December/2025): 27	162.5	A	Four PT providers established additional internationally recognisable services: (i) IPB University (Cr^{6+}, NH_4^+ in wastewater; accredited), (ii) Pusarpedal (pH, conductivity, COD, Cu, Cd, Fe, Mn, Zn, Pb in wastewater; accredited), (iii) BBSPJPPI Semarang (COD, conductivity, colour, Cu, Cd, Cr, Fe, Mn, NO_3, NO_2, NH_4^+, pH, Cr^{6+}, TDS in wastewater; accredited), (iv) BSPJI Medan (pH; not yet accredited). In addition, CESS UNPAD established a new testing service for colour in wastewater, with accreditation in an advanced process. While these results reflect substantial progress in water monitoring, the lack of tangible achievements in gas monitoring represents a missed opportunity that reduced the project's overall effectiveness.
3. *Three industrial companies document the pilot use of climate- and environment-related QI services.* Initial value: 0 Target value: 3	30%	A	Interviews and document reviews did not identify any documentation produced by companies that would demonstrate pilot use of such services. Several activities were implemented under Output 3—including the establishment of a

Current value (December/2025) or estimated value at the end of the project: 0			multidisciplinary think tank, sludge testing, advisory support provided by CESS UNPAD, and awareness-raising seminars. However, these activities did not translate into documented uptake by compa~~nies.~~

*: Appraisal: A = adequate indicator; B = slight objections; C = poor indicator, to be revised if applicable

Overall, the results confirm a strong achievement on the supply side, while demand-side results remain limited. Although some progress was observed in terms of activities and awareness, the specific target under the outcome indicator did not materialise. This dimension therefore has a degree of fulfilment of 77% and thus is rated with “3”, successful to a limited extent.

Dimension 2: To what extent have the intervention’s activities, inputs and outputs considerably contributed to achieving the intervention’s objective (at outcome level)?

In order to achieve the project objective at outcome level, four outputs were agreed upon and implemented.

Output 1: The capacities of the National Metrology Institute (SNSU-BSN) to ensure needs-based metrological traceability and dissemination in water and air analysis are strengthened.

The project’s activities and outputs under Output 1 contributed substantially to the achievement of Outcome Indicator 1 and thus to the project objective. Capacity development measures for SNSU-BSN staff, including training on PT schemes and CRM production, strengthened individual and organisational capacities and enabled the practical application of newly acquired skills (O1-1). These activities supported the expansion and provision of central services such as PTs, assigned values and reference materials, thereby reinforcing SNSU-BSN’s role in ensuring traceability and dissemination in water and gas measurements (O1-6).

Furthermore, the project contributed to an improved demand orientation of SNSU-BSN through needs-based surveys and strategic support provided by PTB. This shift is also institutionally embedded in BSN’s Corporate University as a learning system, which supports the systematic uptake of user needs in capacity development. This improved demand orientation strengthened the relevance and alignment of SNSU-BSN services with the needs of laboratories and other users (O1-3).

The project also strengthened SNSU-BSN’s role as an anchor institution within the national quality infrastructure system (O1-2). This is evidenced by training and support provided to key partner institutions such as the environmental laboratory under the Pusarpedal and by SNSU-BSN’s engagement in supporting PT activities across different regions of the country. However, this contribution is partly constrained by the absence of a clearly articulated overarching strategy for SNSU-BSN’s long-term positioning as a service-oriented metrology provider, including the systematic promotion and profitable marketing of services (O1-5/ O1-7).

Organisational development measures, in particular the Young Talent Programme, further contributed to improved cooperation within BSN, facilitated smooth transition in view of upcoming retirements, and supported innovative pilot approaches, thereby reinforcing the contribution of Output 1 to the project

objective. Through this programme, the project strengthened cooperation between metrology, accreditation, national reference laboratories and environmental laboratories by fostering cross-unit collaboration, joint problem-solving and structured exchange across BSN and its partner institutions (O1-4).

Output 2: The capacities of testing and calibration laboratories to provide services in the fields of water and air analysis are strengthened.

The activities and outputs implemented under Output 2 contributed substantially to Outcome Indicator 2, and thus to the project objective, by strengthening cooperation and quality assurance mechanisms among SNSU-BSN, reference laboratories, regional laboratories and testing laboratories (O2-1). Enhanced cooperation and coordination facilitated the dissemination of technical knowledge and supported laboratories in establishing additional testing and PT services aligned with international quality requirements.

Participation in proficiency testing schemes contributed to improved external quality assurance of environmental testing laboratories. Through regular participation in PTs, laboratories were able to benchmark their performance and identify areas for improvement (O2-3). This contribution is particularly evident in the wastewater sector, where additional PTs and testing services were established by laboratories such as IPB University, BBSPJPPI Semarang, BSPJI Medan, and the Pusarpedal (O2-4).

Capacity development measures for technical staff of environmental testing laboratories further contributed to the project objective. Training activities enhanced technical competencies and, in several cases, enabled the practical application of improved skills, such as improved sampling techniques observed at Environmental Laboratory of the Lombok Regional Environmental Agency (DLH Lombok) (O2-2). However, the contribution of training to sustained service provision varied across institutions. In some cases, newly acquired skills could not yet be fully applied due to accreditation constraints or institutional limitations, as observed for mercury testing at Sanitation Technology Center (BTS) under the Ministry of Public Works and oil and grease testing at Environmental Laboratory of the West Java Provincial Environmental Agency (DLH West Java). In contrast, in the case of the Center for Environment and Sustainability Science of the University Padjadjaran (CESS UNPAD), the application for an extended accreditation scope has reached an advanced stage and is currently pending a formal decision by KAN. While these efforts have not yet resulted in officially accredited additional services, they demonstrate tangible preparatory progress in line with Output 2 (O2-5). This experience also suggests that the implementation of newly acquired knowledge and skills should not be assessed immediately after training sessions, but rather after a period of three to six months, when opportunities for practical application are more likely to arise (see Output Indicator 2.2).

The contribution of training measures was influenced by implementation factors. High demand from laboratories required balancing participant numbers with the capacity of different training formats. While theoretical sessions allowed larger groups, hands-on training required smaller groups for effective learning. Although adjustments were made, variations in participation and group size may have affected the consistent application of skills.

In the gas sector, support included a guest visit to PTB and related procurements for gas standard mixtures, both based on BMKG’s demand. However, compared to water, capacity development measures in gas were more limited in scope and intensity. According to the project team, this limited

focus was justified by structural constraints, including insufficient basic gas metrology capacity, limited national expertise, and weak laboratory and PT infrastructure, which were considered to require long-term investments beyond the project's scope.

Based on the evaluation findings, however, the evaluation team does not fully share this view. Existing capacities, including the development of gas CRMs for automotive emissions and the implementation of PT schemes for automotive gas emission in 2023 and 2024 with public and private laboratory participation, indicate that more targeted gas-related training and mentoring could have been feasible within the project framework.

Output 3: The ability of selected industries to comply with environmental and climate-related requirements has been strengthened on a pilot basis

The activities implemented under Output 3 contributed only to a limited extent to the achievement of Outcome Indicator 3 and thus to the objective. As reflected in the results model, the project focused on piloting demand-side support measures in a specific geographical and sectoral context, with Bandung and the textile industry selected as an appropriate entry point for engaging industrial companies.

Several activities were implemented that supported initial engagement and demand assessments with industry. A multidisciplinary think tank was established to support companies in addressing wastewater and sludge-related challenges, sludge testing activities were carried out, and recommendations for potential technical solutions were formulated (O3-2). In addition, advisory support was provided through a grant agreement with CESS UNPAD, and results were disseminated through a seminar with broad participation from companies in the sector. These activities contributed to increased awareness and initial use of selected QI-related services, particularly in relation to sludge testing (O3-3).

However, as indicated in the results model, these activities did not translate into measurable company uptake, as foreseen under Outcome Indicator 3 (O3-6). This reflects the fact that the sludge-related activities addressed structurally complex and policy-driven issues, which lie largely outside the direct control of companies and could not realistically be resolved within the project period.

While this engagement is relevant and includes the Think Tank as a useful ad hoc platform for collaborative problem solving and contributing to standards development, it has not resulted in measurable company uptake (O3-5), and outreach to smaller enterprises remains limited.

By the time of the evaluation two QI-related training courses for companies were conducted, but there is no evidence of documented company strategies for the systematic use of QI services to comply with environmental and climate-related requirements (O3-4). As a result, while pilot activities and increased awareness were observed, the causal link between Output 3 and sustained, company-led demand-side uptake of QI services remained incomplete.

In addition, gas-related topics were not addressed in relation to industry engagement under this output, further limiting the contribution of Output 3 to the broader project objective.

Output 4: Selected industries and political decision-makers are informed about the relevance of QI services for reliable environmental and climate monitoring

Output 4 aimed at strengthening awareness, mutual understanding and cooperation between the private sector, regulators and BSN through events and exchange formats. Several events and

exchange formats were organised under this output (O4-1), contributing to increased visibility of QI services and providing platforms for dialogue between BSN, regulatory bodies and representatives of the private sector. However, the contribution of Output 4 to the project objective is difficult to measure directly. While interviews and field observations indicate that awareness and informal cooperation likely improved (O4-2/ O4-3), no systematic evidence was collected to demonstrate changes in behaviour, trust levels or sustained cooperation practices resulting from these events. Also, no evidence was found that the dialogue formats under Output 4 resulted in systematic follow-up or improved coordination at the level of political decision-making, as envisaged under O4-4. As such, the causal link between the activities implemented under Output 4 and measurable outcome-level changes remains indicative rather than conclusive. Output 4 plausibly contributed to creating a more favourable environment for dialogue and cooperation, but its contribution to the achievement of the intervention's objective remains indirect.

While Output 1 and 2 made strong contributions to achieve the objective, not concerning the topic of gas, the contribution from the demand side—Output 3 and 4—was limited. Therefore, this dimension was rated with "3", successful to a limited extent.

Dimension 3: To what extent has the quality of the intervention's implementation considerably contributed to achieving the intervention's objective (at outcome level)?

The implementation quality is assessed according to the five Capacity WORKS (CW) success factors, as elaborated below. The project team has used the mandatory Capacity WORKS tool, however, all 35 questions were answered in the same way, namely with "yes", achieving 80-100%. A slightly more self-critical completion of the document would have been helpful for the evaluation team.

CW – Strategy factor

The project strategy was developed in 2021 on the basis of an extensive survey involving around 50 representatives from both the direct and indirect target groups. The results were presented to the partner organisations in a workshop and discussed jointly. Due to the COVID-19 pandemic, the entire process was conducted online. While the partners were well informed about the project's objectives and were partly familiar with its indicators, they did not fully perceive themselves as being jointly responsible for achieving these indicators. The results model was developed without the direct involvement of the partners.

The project invested substantially and systematically in capacity development at all three levels, although not by following a written capacity development strategy. It trained individual employees of the partners through further training measures; institutional and laboratory capacities were strengthened through support for the implementation of PT and CRM production (i.e. GHG CRM through guest scientist visit to PTB); and SNSU–BSN received strategic advisory support to guide its institutional development.

The project's highly agile strategic approach—working simultaneously on a wide range of relevant QI topics with multiple actors—has proven to be effective and successful.

CW – Cooperation factor.

Cooperation with both the various BSN institutions and the four selected laboratories was very satisfactory. All partners contributed to achieving the project objectives in line with their respective capacities and the agreements established with the project. In several cases, sustainable networks

were formed with national and international trainers who continued to provide advice and support to the laboratories even after the support through the project had ended. In addition, the laboratories established informal exchange formats, such as WhatsApp groups, which enabled them to seek and share advice on an ongoing basis.

The project also made effective use of opportunities to integrate partner staff into international networks. For example, in 2025, representatives travelled together to Geneva to attend the World Resources Forum, where they presented the sludge project in a plenary session alongside with other PTB representatives. The presentation emphasized the integrated role of standardization, metrology, and conformity assessment in supporting environmental and climate monitoring systems in Indonesia, in line with the project objectives. Beyond the World Resource Forum sessions, dedicated meetings with international organizations including UN Environment Programme (UNEP), United Nations Economic Commission for Europe (UNECE), ISO, IEC, World Trade Organisation (WTO), and Federal Institute of Metrology in Switzerland (METAS) further expanded opportunities for collaboration in areas such as eco-design standards, digital product passports, circularity verification, and environmental data systems. The trip was followed by a study visit to German Institute for Standardization (DIN), further strengthening professional exchange and networking.

CW - Steering structure factor[3]

The project established a Project Coordination Committee (PCC) comprising relevant representatives from metrology, accreditation, standard development and implementation, human resource development, as well as the designated project focal points. Over the course of the project, the PCC came together three times for meetings lasting approximately three hours. During these meetings, project management presented progress against the indicators and discussed potential new activities.

In addition, regular meetings were agreed upon at the implementation level. Some participants reported difficulties recalling the meetings and noted that they were held too infrequently, expressing a need for more regular exchanges to ensure meaningful involvement. This perception contrasts with the view of the project management, which stated that the originally planned bi-monthly meetings with the focal points had been reduced due to their low levels of interest and participation.

PTB's internal monitoring system had to be comprehensively updated for the purpose of the evaluation. As it was not available at the outset, the evaluation team developed its own evidence map, which was subsequently completed by the project and proved to be a helpful basis for the assessment. The monitoring document was later provided with largely the same information. Regular updates to the monitoring system would have avoided this duplication of effort and significantly reduced the additional workload for the project.

CW – Processes factor

Developments and processes within the sector, as well as the performance of the various stakeholders, were regularly analysed by an PTB-expert. Based on these analyses and the ensuing discussions with the partner organisations, decisions were made, for example, regarding the selection

[3] *Results based monitoring (CW Tool 22) and the operation plan (CW Tool 24) can be used to achieve the indicators of this factor. An elaborate description of the mandatory CW tools and their intended use during project implementation can be found in the document: EVA_32_CW in PTB_EN_240105*

of the sector (textiles) and the regions of intervention. The laboratories themselves were responsible for selecting the parameters to be addressed according to their needs.

Although no formal process map was developed, the training activities and the implementation of the PT were well organised overall. In some cases, however, delays in procurement affected the smooth implementation of activities. Responsibilities were clearly defined, and the various tasks were well coordinated.

With regard to process documentation, the project maintained a comprehensive overview listing all events, participants and institutions involved. However, this document did not fully comply with data protection regulations, as it includes personal information such as names, telephone numbers and email addresses. In contrast, the documentation of business trips is less comprehensive; in many cases, only the agendas were archived.

CW – Learning and Innovation Factor

The project fostered a strong learning culture, with successes and setbacks openly discussed. Lessons learned were systematically captured as part of the monitoring process.

Innovative approaches, such as agile methods for problem solving and idea development (design thinking), were successfully applied. Both the Young Talent Programme and the Sludge Task Force were implemented with high commitment, including active participation from the partners. The Young Talent Programme is now firmly embedded within the partner structures and has demonstrably strengthened the system's capacity.

Both the project and the partner have shown openness to the innovative topic of the circular economy, which will be the focus of the forthcoming project. Initial investigations into the required QI services for transforming collected waste into secondary materials have already been carried out.

After weighing up the various factors, the evaluation team concludes that the quality of implementation is good, and the project is considered as successful "2" in this dimension.

Dimension 4: To what extent has the intervention leveraged potentials of unintended positive results and reacted to risks and/or the occurrence of (unintended) negative results?[4]

The evaluation did not identify any unintended negative effects. Four notable positive effects beyond the expected outcomes can be highlighted:

Strengthened institutional collaboration: The relationship between SNSU-BSN and BMKG improved significantly through their joint work on gas analysis. A memorandum of understanding was adopted, allowing the SNSU gas laboratory to use resources from BMKG, which in turn enables the SNSU to produce gas CRM for BMKG, thereby supporting BMKG's activities in GHG monitoring. In addition, collaboration between SNSU-BSN and Pusarpedal was strengthened, as demonstrated by the signing of a memorandum of understanding between the two institutions.

[4] *If there are no unintended, positive or negative results and the project has not carried out any monitoring of unintended results, this dimension should generally be rated with a "2". A "1" can only be awarded if unintended results have been monitored. Positive unintended results cannot compensate for negative ones; the occurrence of positive and negative unintended results must be presented transparently in the evaluation.*

Recognition of young talent: One participant of the Young Talent Programme applied for the ISO Next Generation Award with a life cycle assessment and was among the top five winners. He will continue to receive support, allowing him to deepen his knowledge, expand his network, and potentially apply his assessment in industry.

International recognition for the sludge pilot project: The pilot sludge project in Bandung achieved notable success and was promoted by ISO, highlighting its innovative approach and relevance in the field of quality infrastructure. While it did not lead to measurable company uptake, this recognition demonstrates the project's impact and its potential as a model for similar initiatives.

Strategic knowledge transfer: PTB has provided long-term advisory support on strategic metrology issues to the BSN and its predecessor institutions. One employee who benefited from this guidance has now risen to a management position and is implementing strategies developed in collaboration with PTB. The project benefited from this expertise, for example, in aligning the Young Talent Programme with a demand-driven approach to standards, even in the face of internal resistance within BSN.

As part of its monitoring system, the project regularly analysed both positive and negative unexpected effects, identified risks, and implemented mitigation measures where necessary.

In summary, the project effectively leveraged the potential of unexpected positive results and monitored them systematically. The project is therefore considered as very successful "1" in this dimension.

Summarized evaluation

Criterion	Evaluation dimension	Weighting	Appraisal
Effectiveness	The intervention has achieved its objective (at outcome level) according to the indicators agreed upon.	25 %	3
	The intervention's activities, inputs and outputs have considerably contributed to achieving the project's objective (at outcome level).	25 %	3
	The quality of the intervention's implementation has considerably contributed to achieving the intervention's objective (at outcome level).	25 %	2
	The intervention has leveraged potentials of unintended positive results and reacted to risks and/or the occurrence of (unintended) negative results.[5]	25 %	1

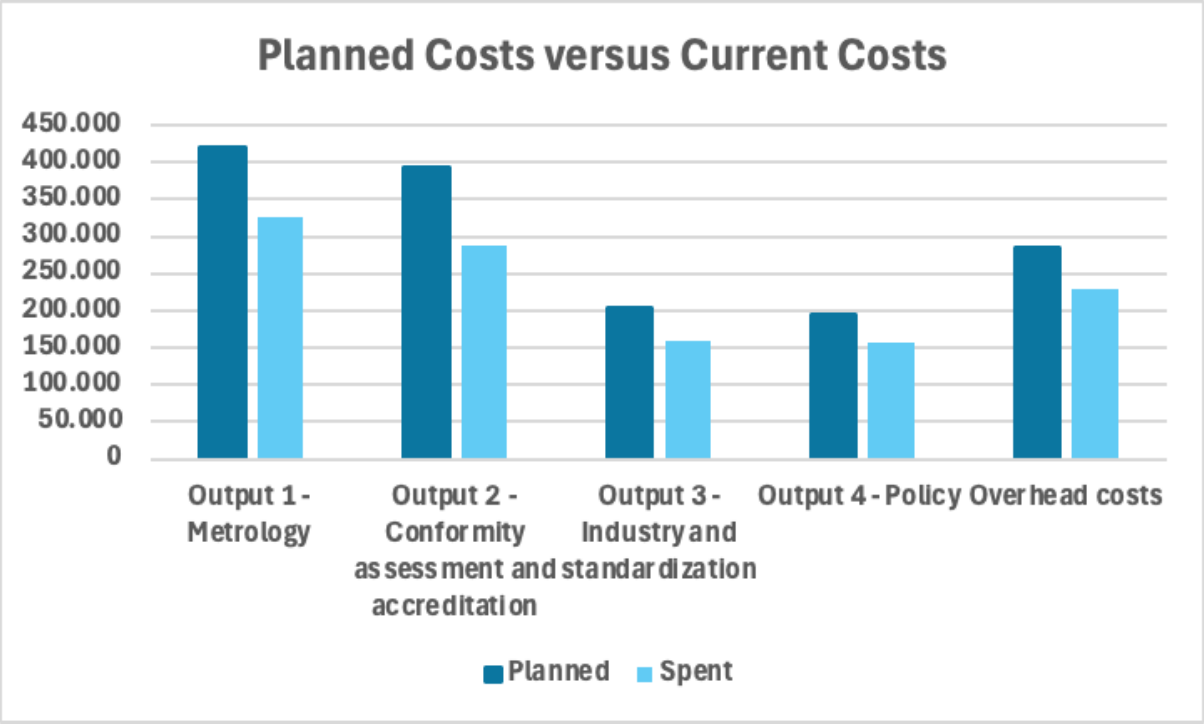
[5] *Positive and negative unintended effects should be weighed against each other. If no unintended effects can be identified and there was no corresponding monitoring system, a "2" should be awarded here. If such a monitoring system was in place, a "1" can also be awarded here.*

Global assessment of the effectiveness	2.3

5.1.4 Efficiency

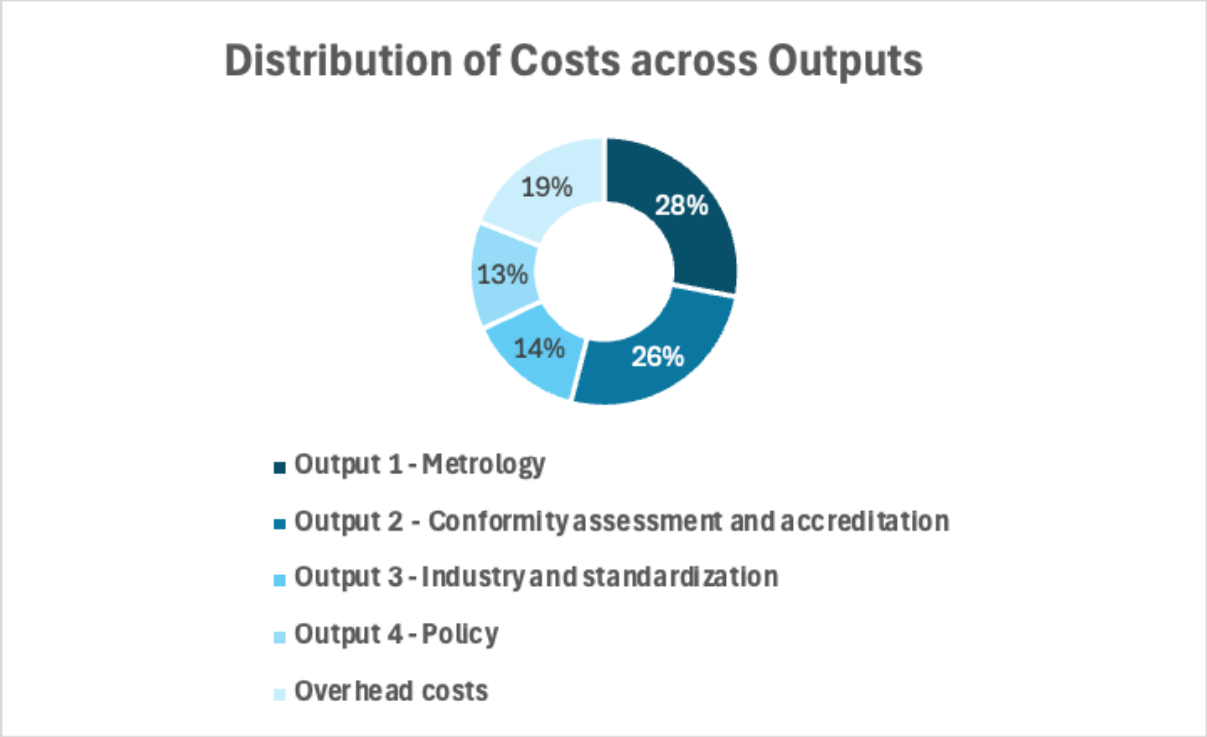
Description of inputs[6]

The project had a budget of EUR 1.5 million. Actual expenditures as of 20 November 2025 were EUR 1,160,945. The project had spent about 77% of its budget up to that point. The following chart shows the planned and actual costs incurred.

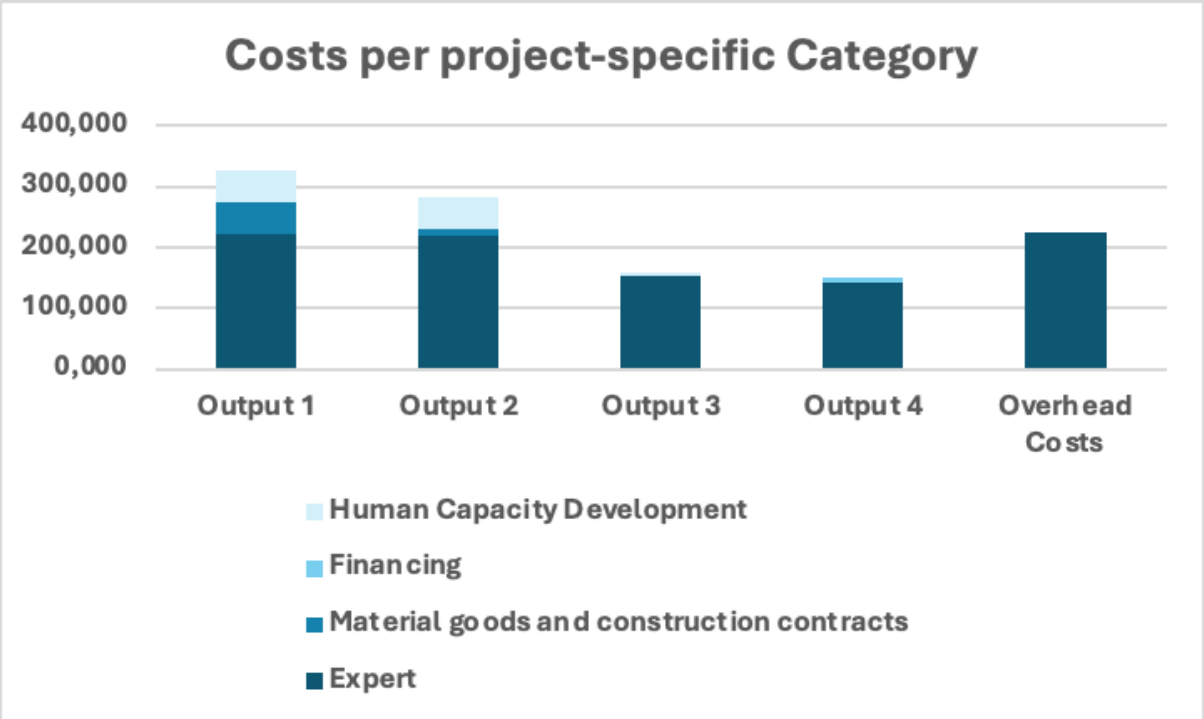


The following chart shows the breakdown between outputs and overheads.

[6] *Expenditure should be presented in aggregated form in order to exclude traceability to personnel costs, specialist days and specific persons. Specific totals should be shown as percentages where possible.*



The costs already spent per project-specific category are as follows.



Dimension 1: To what extent can the use of resources by the intervention be deemed reasonable with regard to the outputs achieved (production efficiency)?[7]

The evaluation dimension „production efficiency" refers to the appropriateness of the relationship between inputs and outputs. Based on the figures provided and the interviews conducted, the evaluation team concludes that the same outputs could not have been achieved with fewer resources (minimum principle). The allocation of resources across the various project-specific categories, as well as among the different outputs, appears comprehensible and appropriate. Overall, the project was managed economically and was also able to make use of synergies.

With regard to the question of whether greater results could have been achieved through a different use of financial resources (maximum principle), the evaluation highlights cooperation with companies under Output 3 as a key aspect. While engagement with smaller companies remained challenging, company size alone does not fully explain the limited demand-side uptake. More decisive appears to be the strategic design and structuring of the support provided. Although the project addressed relevant sludge-related concerns and provided demonstration-oriented activities, these did not sufficiently translate into measurable company uptake.

It remains difficult to assess whether a stronger and more explicit focus on QI services would have produced greater results than the support provided in wastewater and sludge management, or whether a combination of both approaches would have been more effective. Realising the potential of sludge-related results depends on long-term, policy-driven standardisation processes led by the MoE, which were initiated during the project but are unlikely to be concluded within its duration. Consequently, a final judgement on the maximum principle—comparing wastewater and sludge-related activities with a more explicitly QI-focused consulting approach—is not possible.

Regarding the question of whether the outputs were achieved on time and within the planned timeframe, a systematic assessment is difficult, as the evaluation team did not have access to an operational plan that would allow for detailed tracking of activities and their completion over time. Some delays occurred during implementation, which led to a one-year project extension. However, these delays were not significant enough to jeopardise the overall achievement of the project objectives.

In summary, the project managed its financial resources well and did not experience major delays. Whether greater results could have been achieved with the same level of resources cannot be conclusively determined. The dimension is therefore rated successful "2".

Dimension 2: To what extent can the use of resources by the intervention be deemed reasonable regarding the achievement of the intervention's objective/outcome (allocation efficiency)?

The evaluation dimension "allocation efficiency" refers to the appropriateness of the relationship between the inputs and the outcomes achieved by the intervention. As with the previous dimension,

[7] *The evaluation dimension "production efficiency" refers to the appropriateness of the relationship between inputs and outputs. The evaluation dimension "allocation efficiency" refers to the appropriateness of the relationship between the inputs and the results achieved by the intervention. The "efficiency" criterion relates both to the intervention's design and implementation and to the results it achieves.*

the evaluation team concludes that the same results could not have been achieved with fewer resources (minimum principle).

However, with regard to the “maximum principle”, the evaluation team identifies untapped potential.

As noted, several times, the project did not address the topic of gas to the extent originally planned. Of the four new services established at SNSU-BSN with project support, only one related to gas. No additional testing or calibration laboratory in the gas sector, other than BMKG, was supported (Output 2), and the topic of gas was also absent from Outputs 3 and 4.

This is notable given that Indonesia is among the world’s largest emitters of GHG, mainly due to deforestation, slash-and-burn practices, and high energy consumption. At the same time, the country faces the challenge of balancing economic growth with effective climate protection measures. Although the project itself would not have directly contributed to reducing, avoiding, or limiting GHG-emissions, a stronger focus on QI could have indirectly supported climate action. Improved measurement of GHG-emissions, better data for evidence-based climate policy decisions, and reliable verification of compliance with emission limits and mitigation measures could all have been facilitated through strengthened QI capacities.

The limited engagement in the gas sector was explained by the assumption that institutional capacities and demand structures were less developed than in the water sector, and that PTB’s advisory support would therefore be less effective. However, the evaluation revealed a high level of motivation within the SNSU gas laboratory. The laboratory’s competency with regard to GHG CRM production has improved since a young scientist from the gas laboratory was sent for a three-month research stay to PTB in Germany as part of the project. Fifteen gas cylinders required for CRM production have already been procured, followed by the completion of leakage and suitability tests. Moreover, an agreement has already been concluded with BMKG on the joint use of cavity ring-down spectrometer, although the corresponding CRM is still lacking.

The newly acquired expertise could likely have been utilised more effectively and efficiently if the laboratory had received stronger overall support. Based on the interviews, the evaluation team learned that the SNSU gas laboratory conducted a PT on multicomponent gas emission, which partly benefited from the training of young scientists at PTB. This represents an improvement compared to the binary gas PTs conducted in previous years. In this context, the gas sector could be further supported, for example through additional assistance in the organisation of PT schemes, as well as targeted training for gas testing and gas calibration laboratories, similar to the support provided in the water sector. The topic of gas could also have been integrated more strongly into cooperation with the private sector, for example by linking it to the issue of sludge, including the monitoring of gas emissions generated during sludge treatment processes, such as methane and nitrous oxide emissions from sludge digestion, drying, or storage. This could have strengthened the connection between supply and demand side within the project framework.

In summary, while there is no indication that the same objectives could have been achieved with fewer resources, there is credible potential that greater results could have been achieved through stronger engagement in the gas sector, as originally envisaged. The project is therefore awarded a rating of “3”, satisfactory.

Summarized evaluation

Criterion	Evaluation dimension	Weighting	Appraisal
Efficiency	The use of resources by the intervention is deemed reasonable with regard to the outputs achieved (production efficiency).	50 %	2
	The use of resources by the intervention is deemed reasonable with regard to the achievement of the objective/outcome (allocation efficiency).	50 %	3
Global assessment of the efficiency			2.5

5.1.5 Higher-level development results

Dimension 1: To what extent have the intended higher-level development changes taken place or are expected to take place in the near future?[8]

In Indonesia, the Ministry of National Development Planning (BAPPENAS) is responsible for the planning, coordination, implementation, and monitoring of the SDGs. Voluntary National Reviews (VNRs) are published at irregular intervals to report on the status of SDG implementation. The most recent report, from 2025 Indonesian Voluntary National Review (VNR) 2025 does not contain specific information on SDGs targets relevant to the project, while the 2021 report partially addresses SDGs 12 and 13, which are relevant to the project, but provides no detailed information on the specific targets of interest Indonesian Voluntary National Review (VNR) 2021. As a result, it is only possible to assess the extent of higher-level development changes to a very limited degree.

Based on the project proposal and in consultation with the team, five SDG-related impacts were selected during the revision of the results model, to which the project aimed to make a plausible contribution.

SDG 6.3-Improving Water Quality: “Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally“.

In Indonesia, the proportion of bodies of water with good ambient water quality in 2023 is very low compared to other countries in the region. Indonesian rivers rank among the most polluted worldwide. While both industrial and domestic activities contribute to contamination of surface and groundwater, domestic sources are the main contributor. In the textile sector, chemical oxygen demand (COD) and biological oxygen demand (BOD) were reduced by 15–30% between 2018 and 2022, but many facilities still exceed national standards. Heavy metals (Hg, Pb, Cr, Cd) were detected in over 60% of monitored rivers UN Water.

[8] *Potential sources: Country strategy and the programme objectives or, in addition, from relevant development policy strategies, development policy indicators and SDGs*

SDG 9.4–Sustainable Industrialization: “Upgrade infrastructure and retrofit industries to make them sustainable, with increased resource use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes with all countries taking action in accordance with their respective capabilities”.

While specific data for this indicator are not available, Indonesia is actively pursuing related energy and climate goals: expanding renewable energy, improving industrial energy efficiency, and reducing emissions per production unit–all crucial for sustainable industrial processes.

SDG 12.4–Environmentally Sound Management of Chemicals and Waste: „Achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment”.

Indonesia is taking action on SDG 12, but there is still considerable room for improvement, particularly regarding measurable progress in chemical and waste management, data availability, legal enforcement, and the practical application of environmentally sound treatment of hazardous waste. As far as emissions such as NO_2 (coming from the transport sector) are concerned, their current concentration is significantly higher than WHO recommendations, which correlates with respiratory symptoms and diseases. Overall, GHG emissions have increased significantly in recent years. Since 2000, emissions have risen due to growth in the energy and industrial sectors, as well as increases in waste and agricultural emissions. In 2023, emissions reached approximately 69 billion tonnes of CO_2 equivalent, a new record, with further increases expected.

SDG 12.a–Strengthening Scientific and Technological Capacity: “Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production”.

BSN has made significant improvements in scientific and technical capacities. SNSU-BSN has received multiple international recognitions for measurement and calibration competence, for example in chemical-inorganic analysis. National standards (SNI) have been developed, some covering technologically and scientifically demanding fields. BSN provides training and certification in standardization and conformity assessment, issuing more than 8,000 certificates to individuals in 2024 alone. Challenges remain in integrating new technologies and scientific methods, which continue to require additional resources and training.

SDG 13.2–Integrating Climate Measures into Policy: “Integrate climate change measures into national policies, strategies and planning”.

Indonesia has revised its Nationally Determined Contributions (NDCs) several times and resubmitted them to the UN Framework Convention on Climate Change, most recently in October 2025. In doing so, both GHG reduction targets and adaptation measures were formulated more strongly. The country now pursues an integrated climate policy linking mitigation and adaptation. Technical capacities are being expanded to integrate climate data into planning and decision-making processes, and to develop regional adaptation and climate protection plans. Concrete sectoral measures are being implemented, ensuring that climate policy is applied not only in strategic documents but also in practice.

Overall, data availability is limited in some areas, making it difficult to clearly assess the extent of higher-level development impacts to which the project contributed. This limitation is beyond the

influence of the project itself. Based on the available evidence, the project is considered as successful "2" in this dimension.

Dimension 2: To what extent have the results achieved by the intervention (at outcome level) contributed to the intended or implemented higher-level changes.

As no data are available for the period after the project started, it is not possible to provide a reliable assessment of the extent to which the results achieved by the intervention (at the outcome level) have contributed to the above-mentioned higher-level changes. However, it is possible to evaluate whether the project was fundamentally on the right track and thus likely to contribute to further improvements, even if these have not yet been measured or if relevant data are not publicly available.

SDG 6.3: The provision of PTs supported by the project strengthened water monitoring competencies, a key prerequisite for improving water quality. PTs for Chemical Oxygen Demand (COD) contributed to better measurement of wastewater from the textile sector. The provision of CRMs, PTs, and assigned values for heavy metals supported more accurate monitoring in this critical area.

SDG 9.4: The project promoted the adoption of clean and environmentally sound technologies through (i) the introduction of biological processes in textile wastewater treatment plants, and (ii) PTs on wastewater analysis.

SDG 12.4: The project provided PTs on multicomponent automotive gas emissions, contributing to improved monitoring in this area. It also supplied CRMs for GHG, thereby contributing to climate protection efforts.

SDG 12.a: The various PTs and CRMs supported by the project strengthened the scientific and technological capacities of the national quality infrastructure. In addition, through strategic guidance and intensive support for young talents, the project made an important contribution to enhancing the scientific and technological capacity of BSN.

SDG 13.2: All plans and strategies rely on the ability to measure and monitor GHG. The project supported this by assisting the BMKG in measuring GHGs through the provision of GHG CRMs.

Overall, the project made a plausible, though modest, contribution to higher-level changes. Accordingly, the project is considered as very successful "1" in this dimension.

Dimension 3: To what extent has the intervention contributed to positive and not to negative unintended higher-level development changes?[9]

The changes described above, identified by the evaluation team, which were supported by the project, were all considered positive. No unintended negative results were identified. However, it should be noted that the project did not conduct any impact assessments and therefore did not systematically track its results on the higher-level, whether positive or negative.

[9] *If there are no unintended, positive or negative results and the project has not carried out any monitoring of unintended results, this dimension should generally be rated with a "2". A "1" can only be awarded if unintended results have been monitored. Positive unintended results cannot compensate for negative ones; the occurrence of positive and negative unintended results must be presented transparently in the evaluation.*

In this regard, the project is considered as successful “2” in this dimension.

Summarized evaluation

Criterion	Evaluation dimension	Weighting	Appraisal
Higher-level development results	The intended higher-level development results have taken place or are expected to take place.	25 %	2
	The results achieved by the intervention (at outcome level) have contributed to the intended or implemented higher-level results.	50 %	1
	The intervention has contributed to positive and not to negative unintended higher-level development changes.	25 %	2
Total assessment of the higher-level development results			1.5

5.1.6 Sustainability

Dimension 1: To what extent do the partners, target groups and organizations involved have the capacities required to ensure that positive results are continued?

There are strong indications that key partners, target groups and organizations involved possess the institutional and human capacities required to sustain positive results beyond the end of the intervention. Core SNSU services, including certified reference materials, proficiency testing schemes and the provision of assigned values, are embedded within formal mandates and operational structures and are supported by qualified personnel and sustained demand, indicating a sufficient level of institutional capacity and ownership.

Demand-oriented practices have been institutionalized through needs-based surveys integrated into regular planning processes. Within BSN, improved internal cooperation and a stronger focus on demand orientation are likely to persist, as they are anchored in institutional programmes such as the Corporate University and the Young Talent Programme. At the level of target groups, selected regional laboratories have demonstrated the capacity and ownership to maintain project-supported services, with strengthened PT schemes and testing services already operational and utilized.

However, resilience to foreseeable risks varies across institutions. While national-level actors benefit from stronger mandates and resource bases, some regional laboratories remain vulnerable to financial constraints, limited cost-recovery mechanisms and staff turnover. In addition, trust-related concerns among private sector companies in relation to regulatory authorities may affect their sustained engagement with QI services, potentially influencing long-term demand.

Based on the available evidence, the project is considered as successful “2” in this dimension.

Dimension 2: To what extent has the intervention considerably contributed to the capacity of partners, target groups and other organizations involved to continue the positive results?

There are strong indications that the intervention has contributed to strengthening the institutional and human capacities of partners, target groups and other organizations involved, particularly in areas where services were more intensively supported by the project. Through a combination of technical assistance, capacity development and service development, the project supported national and selected regional institutions in establishing and consolidating key QI services, with a stronger emphasis on water and wastewater-related services relevant to environmental monitoring.

At the national level, the intervention contributed to strengthening SNSU's role as a national metrology institution through a combination of strategic advisory support and technical assistance, thereby strengthening institutional positioning and the development and delivery of internationally recognizable services, including certified reference materials, proficiency testing schemes and the provision of assigned values. Beyond enhancing technical capacities, the intervention also strengthened organizational confidence and ownership, enabling SNSU to further position itself as a service-oriented institution responding to clearly identified needs. The integration of demand-driven planning tools, such as needs-based surveys, into routine processes can be largely attributed to project support and, together with the strategic advisory support provided, represents a key contribution to longer-term sustainability.

Within BSN, the intervention supported improved internal cooperation and coordination by linking technical capacity development with institutional learning mechanisms. Embedding project-related learning into structures such as the Corporate University and the Young Talent Programme helped retain competencies within the organization and facilitated knowledge transfer beyond individual participants, thereby reducing the risk of capacity loss due to staff turnover and strengthening organizational resilience.

At the level of target groups, the intervention contributed to strengthening technical and operational capacities in selected regional laboratories through targeted training, hands-on support and the introduction or expansion of PT schemes and testing services. Evidence from participating laboratories indicates that acquired skills and knowledge have been applied in practice, supporting the continuity of quality assurance functions. While the intervention did not explicitly target disadvantaged groups in a social sense, it addressed sub-regional disparities in access to QI services by supporting BSPJI Medan to develop capacities as a PT provider in North Sumatera Province, a region with significant industrial activity, and by extending targeted technical training to relatively under-served regions, including staff from the DLH Lombok in central Indonesia, where access to competency development and laboratory infrastructure is more limited. In addition, cooperation with the strategic partner Pusarpedal enabled seminars and training activities to reach a broader range of regional actors across several provinces, thereby expanding outreach beyond individual regions and reinforcing the project's national reach.

The ongoing standards development process and planned publication of a sludge-related guidance document by the Bandung regional government contribute to institutional strengthening and may foster a supportive environment for the use of QI services in the future. However, at the time of the evaluation, there was no evidence that these developments had generated sustained demand at the company level.

Overall, the intervention has played a significant role in building capacities, fostering ownership and enhancing resilience among key actors. However, the extent of these contributions varies across institutions and thematic areas, and not all risks related to financial sustainability, cost recovery and external engagement can be fully addressed within the project timeframe.

This dimension is therefore rated as successful ”2”.

Dimension 3: To what extent are the results of the intervention durable?

Under the prevailing conditions, many of the intervention’s results can be considered durable, particularly those related to core QI services and institutional practices that have been embedded within formal mandates and operational structures. Services such as PT schemes, CRMs and the provision of assigned values are already operational and utilized, indicating a reasonable likelihood of continuation beyond the project period.

The durability of these results is supported by contextual factors beyond the intervention itself. Regulatory requirements in water and wastewater monitoring, together with accreditation and compliance obligations, create ongoing demand for key QI services. In the gas sector, the intervention strengthened technical competencies at SNSU through support for GHG CRM development. Although the CRM production was not completed within the project period, indications of continued production activities and the application of acquired competencies in multi-component gas emission proficiency testing schemes suggest a reasonable likelihood that gas-related QI services will continue, albeit at a lower level of maturity than water services.

At the same time, the durability of results is subject to several risks. Financial constraints and limited cost-recovery mechanisms may affect the long-term sustainability of some institutions, particularly at the regional level. However, ILCs established for laboratory networks in Bandung and Surabaya provide an alternative quality assurance mechanism when access to formal PT schemes is limited. While staff turnover risks have been partly mitigated at BSN through institutional learning mechanisms such as the Corporate University, they remain a challenge for some regional laboratories. Industry engagement also remains limited, partly due to perceived regulatory risks. Although the intervention initiated industry-oriented activities, including think tank discussions, limited technical advice and outreach to parts of the textile industry, these efforts have not yet resulted in measurable company uptake. Progress in sludge-related areas depends on formal standardisation processes under BSN, involving multiple stakeholders and regulatory coordination. As these processes extend beyond the project timeframe, regulatory clarity and sustained industry participation may evolve only gradually.

Overall, the results of the intervention demonstrate a good degree of durability under current conditions, particularly on the supply side. On the demand side, however, documented company utilisation remains limited and long-term sustainability of demand is not yet fully evident. Ongoing sludge-related standard development under BSN specifically through the formal process under BSN Regulation No. 8/2022, involving relevant stakeholder (the Ministry of Environment and Forestry (KLHK), the Ministry of Industry, testing laboratories, and associations) provides a structurally embedded basis for the gradual strengthening of demand over time. Financial and capacity risks persist, but do not fundamentally undermine the continuation of established services.

Based on the available evidence, this dimension is rated “2”, successful.

Summarized evaluation

Criterion	Evaluation dimension	Weighting	Appraisal
Sustainability	The partners, target groups and organizations involved have the capacities required to ensure that positive results are continued.	33.33 %	2
	The intervention has considerably contributed to the capacity of partners, target groups and other organizations involved to continue the positive results.	33.33 %	2
	The results of the intervention are durable.	33.33 %	2
Total assessment of the sustainability			2

5.1.7 Summary of the intervention's contributions to the 2030 Agenda for Sustainable Development

Universality, shared responsibility and accountability

Due to its design, the project contributed to the four selected SDGs (6, 9, 12 and 13), specifically to targets 6.3, 9.4, 12.4, 12.a and 13.2. In some cases, these contributions were direct, while in others they were more indirect. An example where the link can be clearly established is target 6.3, which aims to improve water quality by reducing pollution, eliminating dumping, minimising the release of hazardous chemicals, and increasing the safe reuse of wastewater. The project supported the availability and use of QI services for water monitoring, thereby strengthening the basis for pollution control and regulatory enforcement.

The project addressed the needs of both indirect and direct target groups. For the indirect group, it supported initiatives such as the development of GHG CRMs with SNSU and BMKG and the Young Talent Programme at BSN. For the direct group, particularly QI users, the project provided advisory support, including training and mentoring for laboratories. Engagement with approximately 20 textile companies supported the development of sludge-related standards, but sustained use of QI services at the company level did not materialize.

The project made use of partners' existing facilities, such as laboratories, to deliver training activities. SNSU-BSN was closely involved in selecting laboratories to receive PT support and participated throughout the entire process with its own laboratory. Almost all project activities were closely interlinked with partners, reflecting a strong commitment to shared responsibility. The project also cooperated closely with the PTB photovoltaic project in Indonesia, although interaction with other projects remained limited.

Regarding monitoring and accountability, the project developed its own system and collected relevant data, though it relied on partner-provided information for most indicators, rather than using a fully joint monitoring system. Overall, the project fostered a strong learning culture and demonstrated openness

to innovative approaches, such as agile methods for problem solving and idea development (design thinking).

Interplay of economic, environmental and social development

This project strengthens the availability of QI services in environmental protection and climate monitoring, primarily through support for water analysis and, to a lesser extent, air analysis. By combining laboratory capacity building, support for standardization, and institutional strengthening, this intervention results in mutually reinforcing improvements, enhancing data reliability, the regulatory framework, and the sustainability of the national QI system.

These outcomes primarily contribute to stronger environmental governance and provide indirect benefits to public health. However, private sector involvement remains limited, and therefore economic contributions are largely indirect, mediated through improved institutional and regulatory conditions.

Inclusiveness/Leave no one behind

Due to the long and complex chains of impact, it is virtually impossible to directly measure the project's effects on particularly disadvantaged groups within PTB projects. Therefore, improvements can only be described in plausible terms. Nevertheless, as outlined above, the project clearly contributed to improving the living conditions of the Indonesian population, particularly with regard to access to clean water and the reduction of GHG-emissions. In this context, the project sought to promote more inclusive regional access to QI services, including support for BSPJI Medan as a prospective PT provider in North Sumatera and the participation of representatives from central Indonesia laboratories such as the DLH Lombok. These measures contributed to greater geographic inclusiveness, although direct effects on vulnerable population groups could not be demonstrated.

Since 2010, access to clean water has been officially recognised by the UN General Assembly as a human right, affirming that every individual is entitled to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic use. This right is fundamental to the preservation of human dignity. By establishing the foundations for reliable water analysis, the project makes a meaningful contribution to the realisation of this right.

In addition, the UN General Assembly adopted an internationally recognised right to a clean, healthy and sustainable environment in 2022, which includes the right to clean air. This right is essential to human life, health and dignity and obliges states to take measures to protect air quality—an area to which the project in Indonesia has made a tangible contribution.

6. Assessment of specific evaluation questions

The following questions were formulated by the project team to be investigated as part of the evaluation:

1. How did the project deal with the changed situation of the Indonesian QI (especially of the metrology institute) and the connected implicit expectations that are formulated in the module proposal, but not measured in the indicators e.g. towards
    - supporting the cooperation among the QI-institutions under the umbrella of BSN for developing integrated QI-services;

- supporting the coordination of BSN with other relevant actors for covering the vast IDN with limited capacities;
- supporting capacity development of BSN new staff;
- supporting the institutional orientation of BSN towards applying more needs-based, user-oriented approaches?

Several interviewees—including representatives from BSN—reported that both staff and management tend to work in silos and often find it difficult to move beyond them. As one member of BSN management noted, “The project forced us to cooperate.” The project contributed to overcoming these silos in particular through the Young Talent Programme. Within small, mixed working groups composed of representatives from metrology, standardisation, and accreditation, participants were required to collaborate on the development of pilot projects. For example, during the boot camp, each group was tasked with producing a short video on QI support for SMEs, which required them to jointly identify the nature of the company, assess its specific QI-related needs, and demonstrate how QI could support stakeholders. The aim was to foster interdisciplinarity and strengthen cross-departmental cooperation. This approach was later adapted by BSN and applied, for example, in discussions on the circular economy. An example of a needs-based and interdisciplinary QI approach emerged, in which QI considerations were framed around market needs rather than predefined standards. The involvement of the Indonesia Packaging Federation further reinforced this user-oriented perspective by bringing industry needs into the discussion.

This project supported the strengthening of SNSU as an anchor institution within the national QI system by providing targeted technical support and strategic advice (see also Chapter 7 Learning processes and experiences). This helped improve coordination of QI services and support to regional laboratories in a geographically large and decentralised country.

A key component of both, the training courses offered by PTB under the Young Talent Programme and the strategic advisory services, was the promotion of innovative approaches in the field of QI. In particular, this concerned the distinction between government-driven and industry-driven regulation. Many ministries—and in some cases BSN itself—tend to rely heavily on comprehensive regulatory control rather than on standards that emerge from market needs or tender requirements. By placing greater emphasis on industry-driven regulation, the intention is, on the one hand, to avoid unnecessarily constraining innovation through unsuitable standards. On the other hand, it aims to improve efficiency within BSN by ensuring that standards are developed in response to actual demand from industry or consumers, rather than being produced without clear application. PTB repeatedly addressed this issue throughout the project, thereby contributing to a gradual shift in institutional thinking.

2. How did the project fare with the changing frame conditions that affected its "internal coherence", especially with the German development organisations, as there were:
   - the early de-prioritization of the Environmental Early Warning System component;
   - the limited or missing alignment possibilities with the GIZ's Green-Infrastructure-Initiative (GII);
   - the shifted priorities of the German-Indonesian cooperation, as reflected in the current BMZ Country Strategy Indonesia of 2024?

During the government-to-government negotiations when this project was planned, the Indonesian side expressed a strong interest in receiving support to establish an environmental early warning system for the detection of slowly developing environmental disasters. The German side initially agreed and commissioned the project accordingly. However, responsibility for this component was later transferred to GIZ, and ultimately the system was not further pursued by the German side. As this component had always been conceived as an add-on—for which BMZ would have provided an additional EUR 0.5 millions if required, but which was not anchored in the project's indicators—this change did not have a significant impact on the overall project design.

It was also originally envisaged that the project would cooperate with GIZ within the framework of the German government's Green-Infrastructure-Initiative. However, no suitable opportunity for collaboration emerged, partly due to significant implementation delays. In addition, the strategic focus of German development cooperation gradually shifted away from water and technical and vocational education and training (TVET) towards climate change. Although the project could have linked well to this new focus through its work on gas analysis, its primary emphasis remained on the water sector, and cooperation with GIZ therefore did not materialise in this area either.

Overall, the project was not derailed by these challenging external circumstances and was implemented largely in line with the agreed objectives and indicators. Looking ahead, however, the outlook is considerably more favourable. The follow-up project will be embedded in a broader programme on circular economy. Initial contacts with GIZ have already been established, the project is involved in key decisions related to programme development, and it is well positioned to make a substantial contribution through its technical expertise in QI. Here, too, regulatory aspects play an important role. Thanks to the strategic advice provided by PTB, BSN is now better prepared to recognise that effective regulation is not about developing standards, declaring them mandatory, and relying on conformity assessment alone. Instead, standards, regulatory, and conformity assessment needs within the circular economy must first be carefully analysed so that appropriate, effective and coherent regulatory frameworks can then be developed.

3. How did the project fare in building learning cases and good practices that can be applied for a new project?

The project has gained considerable experience in supporting the implementation of PT and advising on the development of new QI services (see also Chapter 7 Learning processes and experiences). Of particular interest, however, is understanding why cooperation with the private sector has been less successful. From the evaluation team's perspective, several challenges have played a role. On the one hand, there is a general lack of knowledge about QI issues among the SMEs. On the other hand, companies often fear that engagement could lead to additional mandatory standards that might restrict production. Furthermore, businesses are naturally reluctant to disclose sensitive information, especially regarding environmental aspects that may not yet meet standards.

These challenges are likely not unique to PTB's work in Indonesia but affect the organisation's private-sector engagement more broadly. It would therefore be advisable for PTB to explore ways to better approach companies and 'market' its services in a manner that is attractive to them and not perceived as a threat. The strong interest shown by companies in information on sludge-related results indicates that there is demand for practical, problem-oriented knowledge. Building on this interest, future activities could place greater emphasis on clearly defined, company-relevant QI services that are feasible within project timeframes.

7. Learning processes and experiences

Lessons learned during the project

A key lesson from the ECMI project is the importance of strengthening a central QI institution as an anchor institution. Positioning SNSU-BSN in this role improved coordination of services, dissemination of technical knowledge, and support to regional and sectoral laboratories. This approach proved effective in a geographically large and decentralised country, but also highlighted that an anchor role requires not only technical capacity, but clear strategic guidance to prioritise services, manage demand, and ensure long-term sustainability

Another important lesson concerns the effectiveness of a demand-driven approach. Systematic needs-based surveys helped focus project activities on services with clear relevance, particularly in the water sector, increasing ownership and the likelihood that services such as PT schemes and CRMs will continue beyond the project period. At the same time, the project's experience showed that demand-driven approaches require sufficient time and trust-building, especially when engaging with private sector actors and where QI services are perceived as closely linked to regulatory compliance.

The experience in the gas sector provides an additional lesson. While gas-related QI services proved more complex and slower to develop than those in water, early investments in technical competence generated lasting value even where final outputs were delayed. Support for GHG CRM development strengthened analytical know-how at SNSU, parts of which were subsequently applied to multi-component gas emission PT schemes, demonstrating how capacity-building in less mature QI areas can yield indirect and incremental results that support longer-term service development.

The project also demonstrated that capacity development is more effective when embedded in institutional structures rather than delivered as stand-alone training. Integrating learning into mechanisms such as the Corporate University and the Young Talent Programme supported internal cooperation, continuity, and knowledge transfer within BSN, while reducing risks related to staff turnover.

Finally, the project showed the value of pilot-based approaches. Pilot services and cooperation formats enabled stakeholders to test new approaches, adjust interventions based on experience, and reduce risks before scaling up, particularly in areas characterised by limited trust or newly introduced QI services.

Transferable knowledge for other PTB projects

The ECMI project generated several lessons relevant for other PTB interventions. Strengthening a national reference institution as an anchor proved effective in contexts with uneven regional capacities, as it supported coordination across institutional levels. Demand-driven planning, operationalised through structured needs assessments, helped prioritise relevant QI services and supported their sustainability, while embedding capacity development in institutional learning systems enhanced long-term impact and reduced reliance on external support.

The experience in the gas sector provides additional transferable insights for projects operating in emerging or less mature QI fields. Gas-related services typically require longer development horizons and may not deliver immediate outputs comparable to more established sectors. However, early investments in technical competence-such as support for GHG CRM development-generated lasting

value by strengthening analytical know-how, which was subsequently applied to multi-component gas emission PT schemes. This illustrates how capacity-building in nascent QI areas can yield indirect and incremental benefits that support longer-term service development.

The project also confirms the value of pilot-based interventions as a learning and risk-management tool, enabling PTB projects to address complexity and uncertainty in a gradual and adaptive manner, particularly in environmental and climate-related QI fields where regulatory, technical and market conditions continue to evolve.

Challenges encountered and solutions relevant for other projects

Several challenges encountered during the ECMI project are relevant for other PTB interventions. Private sector engagement-across company sizes-was constrained by trust issues with regulatory authorities and perceived compliance risks, indicating the need to involve neutral intermediaries, clarify incentives, and allow sufficient time for confidence-building.

Another challenge was the uneven development across thematic areas. While water-related services benefited from strong regulatory demand and established laboratory networks, gas-related QI services progressed more slowly due to limited basic capacities and weaker demand, highlighting the importance of realistic scoping and, where appropriate, phased or longer-term approaches for technically complex fields.

Finally, the project highlighted the challenges of translating industry-relevant QI issues into documented demand-side uptake within the project's timeframe. While the sludge management case demonstrated clear relevance to QI, the standardization processes require a longer timeframe. Consequently, the specific target indicator did not materialize during the project period.

Topics for further internal PTB exchange

Based on the ECMI experience, several topics would benefit from further internal PTB exchange, including approaches to demand-side engagement in low-trust environments and strategies for embedding capacity development within partner institutions. Exchange on these topics could support the continuous improvement of PTB’s QI projects.

8. Recommendations

Recommendations to partners;

Identify and utilise available entry points for incremental progress in the gas sector to strengthen gas-related metrology services, including testing, calibration, PTs, CRMs, as well as GHG measurements and automotive emissions (Sections 5.1.3, 5.1.6, 7).

Further institutionalise collaboration with the Ministry of Environment to ensure systematic follow-up of results from industry consulting and pilot activities within ongoing policy and standardisation processes, thereby strengthening quality infrastructure in the environmental sector (Sections 5.1.3, 5.1.6, 7).

Recommendations to the project team;

Place stronger emphasis on the selection and engagement of medium-sized companies that are not yet well acquainted with QI concepts and are therefore likely to benefit more from project support than well-established companies (Sections 5.1.3, 7).

While continuing to focus on problem-oriented initiatives such as the sludge case, the project team should also maintain close attention to Outcome Indicator 3. This can be achieved, for example, by more systematically encouraging and documenting company-level use of QI-related services, thereby generating measurable evidence of uptake without expanding the project scope (Sections 5.1.3, 7).

Support BSN in developing a more structured approach to engaging private companies with a focus on clear communication of the QI value proposition and trust-building (Sections 5.1.3, 7).

Proactively identify and utilise available entry points for advancing gas-related capacities (Sections 5.1.6, 7).

Continue to provide consultancy support to SNSU-BSN in developing and further operationalizing its long-term strategic master plan to strengthen its role as an anchor institution in the national QI system, recognizing that internal ownership and sustained momentum within BSN are essential prerequisites for its successful implementation (Sections 5.1.6, 7).

Ensure that monitoring systems are regularly updated to avoid the need for parallel tools such as evidence maps and to significantly reduce the additional workload for project teams (Section 5.1.3).

Assess the implementation of newly acquired knowledge and skills not immediately after training activities, but after a period of three to six months, when opportunities for practical application have materialised (Section 5.1.3).

Recommendations to the International Cooperation Department (Group Q.3);

Review and consolidate best practices for engaging with the private sector across PTB-projects in order to develop a more effective strategy for private-sector engagement and to respond proactively to the BMZ's increasing interest in private sector development (see Objective 3 of BMZ-Reformplan "Zukunft zusammen global gestalten" – BMZ January 2026) (Sections 5.1.1, 6, 7).

Formulate an output and corresponding indicators that capture improvements in BSN's strategic capacities, in order to better cover the real support of the project to BSN and measure its strategic results (Section 5.1.1).

Design output indicators to comprehensively measure outputs rather than focusing on individual aspects of outputs (Sections 5.1.1, 5.1.3).

Recommendations to the evaluation unit of Working Group Q.01;

Not applicable.

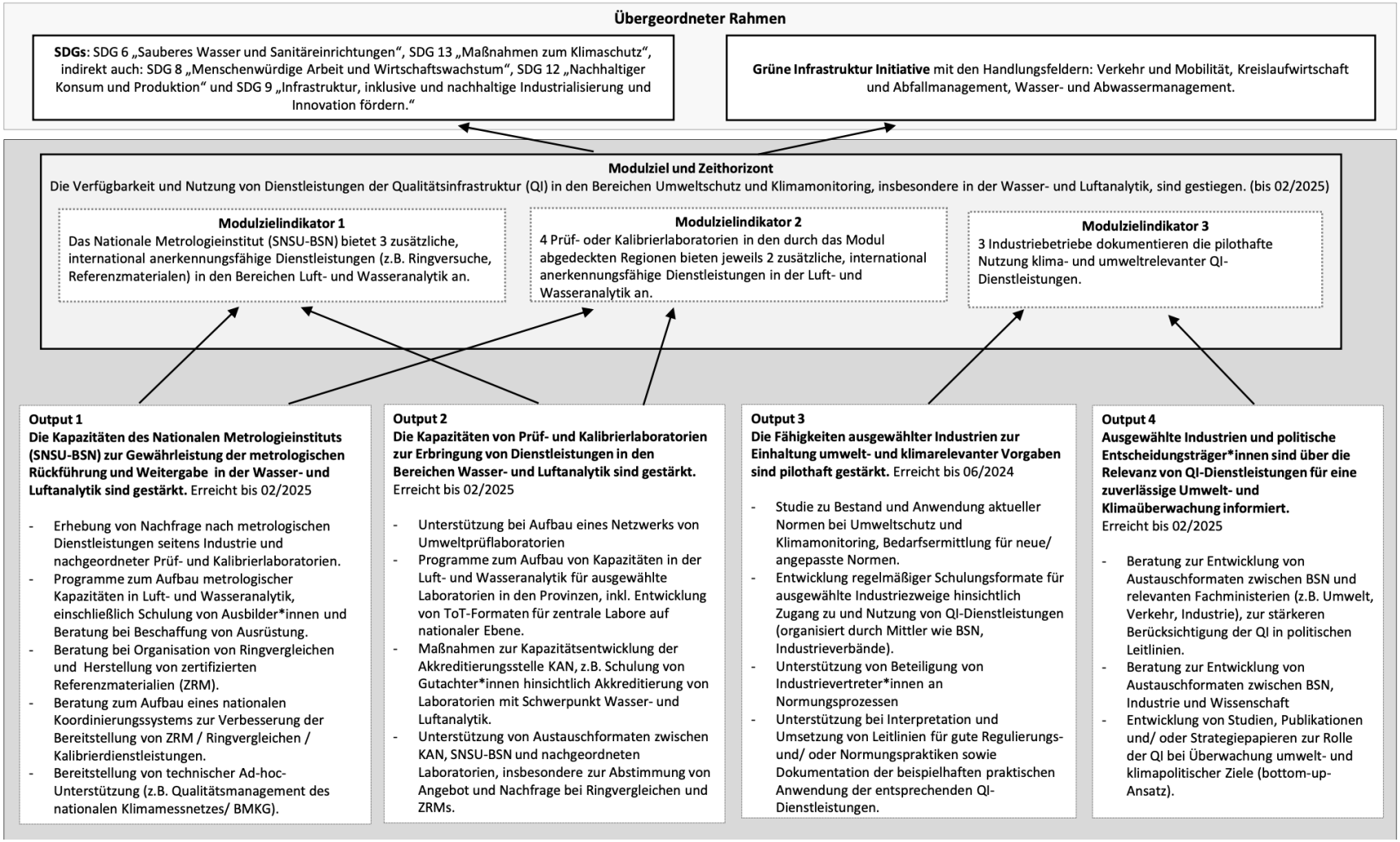
9. Annexes to the evaluation report

1. Intervention logic (from the module proposal)
2. Results Model - Capacity WORKS tool 7
3. Evaluation schedule
4. List of contact persons
5. Interview guidelines

Editor **International Cooperation**
Physikalisch-Technische Bundesanstalt
Bundesallee 100
38116 Braunschweig, Deutschland
www.ptb.de/q.3/de

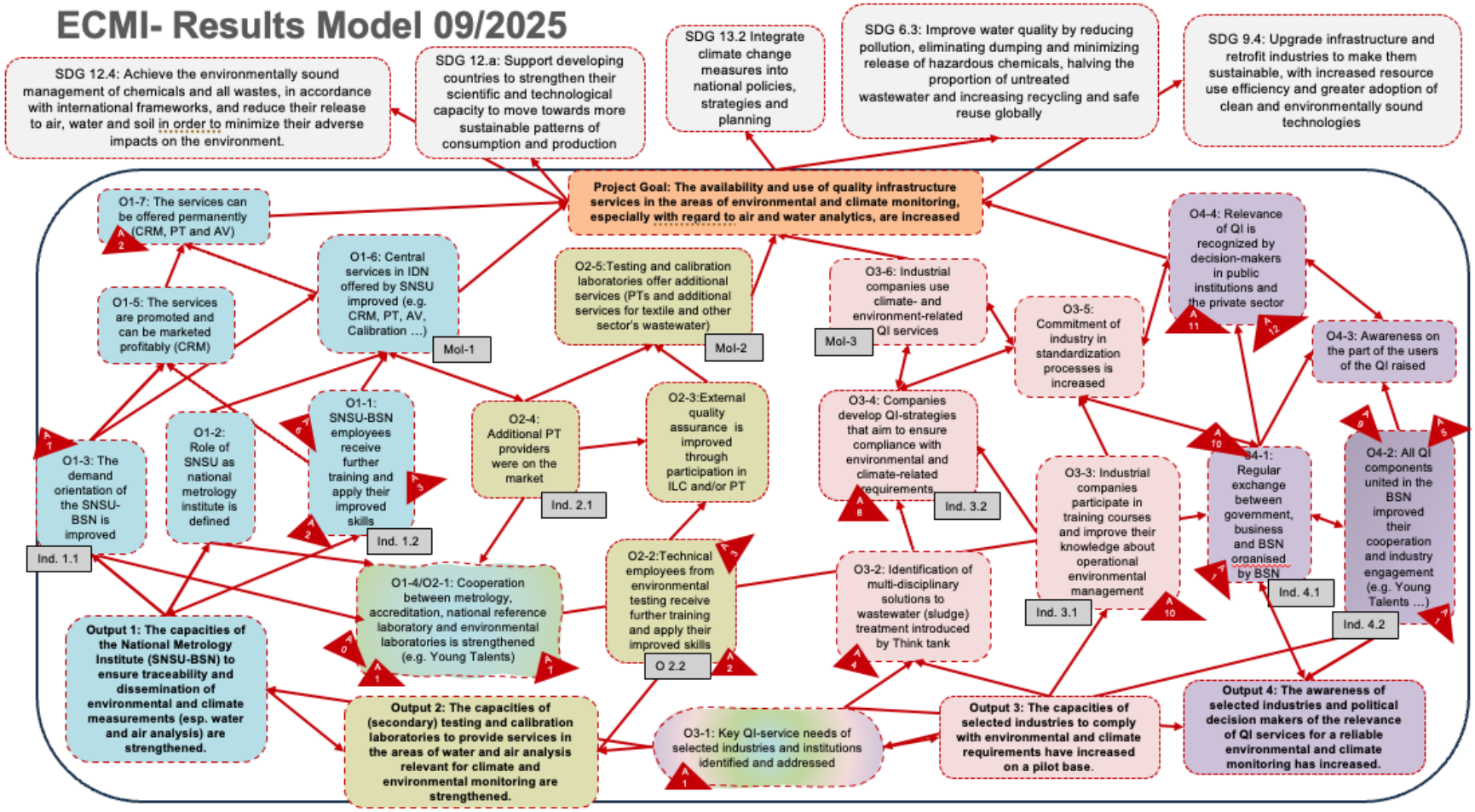
Image © PTB
Lead Evaluator Annette Schmidt
Responsible Dr.-Ing. Katharina Lehrmann
Date April 2026

Annex 1 – Intervention logic



Annex 2 – Results Model

GHG validation and verification (



Annex 3 – Evaluation schedule

Date	Activity
Preparation phase	
15/08/2025	Preparatory meeting
30/09/2025	Delivery of first draft Inception Report by the key evaluator
07/10/2025	Review of the first draft by PTB – PTB delivery of a single consolidated document with all PTB comments
14/10/2025	Delivery of second draft Inception Report
17/10/2025	Review of the second draft by PTB
24/10/2025	Delivery of pre-final Inception Report
04/11/2025	Partner provides comments
11/11/2025	Finalizing of the Inception Report by the key evaluator
10 – 11/2025	Review of documents
11/2025	Virtual interviews
Field phase and presentation	
24 – 28/11/2025	Visit to Indonesia
09/01/2026	Presentation and discussion of the preliminary findings and recommendations (online)
Report writing phase	
12/01/2026	Delivery of draft Evaluation Report
19/01/2026	Review of the first draft by PTB – PTB delivery of a single consolidated document with all PTB comments
26/01/2026	Delivery of second draft Evaluation Report
04/02/2026	Review of the second draft by PTB
11/02/2026	Delivery of pre-final Evaluation Report
25/02/2026	Partner provides comments
04/03/2026	Finalizing of the Evaluation Report by the key evaluator
11/03/2026	Delivery of first draft of short version and one-pager
18/03/2026	Review of the first draft by PTB
01/04/2026	Finalizing of the short version and one pager by the key evaluator
08/04/2026	Presentation and discussion of the conclusions and recommendations at PTB Group Q.3 (virtual)

Annex 4 – List of contact persons

Date	Place	Number of People	Institutions
November 10 – 21, 2025	Virtual	21 people (11 women)	1. National QI institutions (accreditation, standardisation and metrology bodies) 2. Testing laboratories 3. PT providers 4. Users of QI services (companies/ industry associations) 5. PTB representatives 6. Technical experts from PTB 7. Representatives of international cooperation 8. Research institution and university 9. Downstream offices of ministries
November 24 – 28, 2025	Jakarta Serpong Bandung	39 people (22 women)	

Annex 5 – Interview guidelines

Explanatory notes:

1. Depending on the level of involvement of the interviewee, the relevant questions will be chosen by the interviewer, which means that not all questions listed will be asked of all interviewees.
2. During the evaluation process additional questions will arise and questions that turned out to be irrelevant will be deleted.
3. The evaluation process starts with general questions, e.g. what have been the relevant activities and how did they develop? Then the detailed questions listed below will follow.

<u>OECD – DAC Criteria Relevance</u>

Dimension 1: To what extent is the intervention's design geared to country-specific, regional, and global policies and priorities of the partners and the BMZ?

- To what extent are the objectives of the intervention geared to the partners' policies and priorities?
- To what extent are the relevant political and institutional framework conditions considered in the intervention's design?
- To what extent is the intervention's design geared to the BMZ's country strategy and the BMZ's sectoral concepts?

Dimension 2: To what extent is the intervention's design geared to the needs and capacities of the target groups?

- To what extent are the intervention's objectives aligned with the development needs and capacities of the involved and benefitting individuals, groups or organisations?
- To what extent are the intervention's objectives and design geared to the needs and capacities of particularly disadvantaged and vulnerable beneficiaries and stakeholders (individuals, groups and organisations)?

Dimension 3: To what extent is the intervention's design appropriately, realistically and plausibly geared towards achieving the intervention's objective?

- To what extent is the intervention's design appropriate and realistic (in terms of technical, organisational and financial aspects)?
- To what extent is the intervention's design sufficiently precise and plausible (in terms of the verifiability and traceability of the system of objectives and the underlying assumptions)?
- This includes the following questions: 1. Are the indicators at objective level, suitably chosen to quantify the level of achievement according to the SMART criteria? 2. Are the activities and outputs plausibly geared towards achieving the intervention's objective? 3. Are the underlying results hypotheses plausible?
- To what extent is the intervention's design based on a holistic approach to sustainable development (interaction of the social, environmental and economic sustainable development goals)?

Dimension 4: To what extent has the intervention's design responded to changes in the environment and adapted to the needs?

- To what extent has the intervention's design responded appropriately to changes in the environment (risks and potentials) in the course of the implementation?

OECD – DAC Criteria Coherence

Dimension 1: Internal coherence: Within German development cooperation, to what extent was the intervention designed and implemented in a complementary manner, based on a division of tasks?

- Within German development cooperation, to what extent is the intervention designed and implemented (in the country/region) in a complementary manner, based on the division of tasks?
- To what extents have synergies been leveraged?
- To what extent is the intervention consistent with international and national norms and standards to which German development cooperation is committed (e.g., human rights)?

Dimension 2: External coherence: To what extent does the intervention's design and implementation complement the partner's own efforts and is coordinated with other donors' activities?

- To what extent does the intervention complement and support the partner's own effort (principle of subsidiarity)?
- To what extent have the intervention's design and implementation been coordinated with other donors' activities?
- To what extent has the intervention's design been geared to the use of existing systems and structures (of partners/other donors/international organisations) for implementing the activities? To what extent are these systems and structures used?
- To what extent are common systems (together with partners/other donors/international organisations) used for M&E, learning and accountability?

OECD – DAC Criteria Effectiveness

Dimension 1: To what extent has the intervention achieved its objective (at outcome level) according to the indicators agreed upon?

- To what extent has the intervention reached or is the intervention expected to reach its objective by the end of the term?

Dimension 2: To what extent have the intervention's activities, inputs and outputs considerably contributed to achieving the intervention's objective (at outcome level)?

- To what extent have the defined inputs been delivered and the outputs agreed upon been achieved? To what extent have the beneficiaries used the benefits and results achieved by the intervention and thus contributed to achieving the intervention's objective
- Can the outputs be accessed equally by the target group (e.g. despite physical limitations, discrimination, financially)? To what extent has the project goal been achieved regarding especially disadvantaged or vulnerable groups?
- Were there external or internal factors that had a decisive influence on the achievement/non-achievement of the intervention's agreed objective?

Dimension 3: To what extent has the quality of the intervention's implementation considerably contributed to achieving the intervention's objective (at outcome level)?

- How should the quality of steering and implementation of the intervention be assessed (including the partners' participation and contributions) in terms of the achievement of the project's objectives?

Dimension 4: To what extent has the intervention leveraged potentials of unintended positive results and reacted to risks and/or the occurrence of (unintended) negative results?

- To what extent can unintended positive results of the intervention be identified or foreseen? What potential benefits arise from positive unintended results?
- To what extent can unintended negative direct results of the intervention be identified or foreseen? What potential risks arise from unintended negative direct results?
- Has the intervention appropriately monitored and promoted positive direct results? Has the intervention responded appropriately to risks and (if applicable) the occurrence of negative results?

OECD – DAC Criteria Efficiency

Dimension 1: To what extent can the use of resources by the intervention be deemed reasonable with regard to the outputs achieved (production efficiency)?

- To what extent could the achieved outputs have been delivered using fewer financial resources (minimum principle)?
- To what extent could the intervention's results (at output level) been increased by using the financial resources differently (maximum principle)?
- Were the outputs (products, capital goods and services) achieved on time and within the planned timeframe?

Dimension 2: To what extent can the use of resources by the intervention be deemed reasonable regarding the achievement of the intervention's objective/outcome (allocation efficiency)?

- To what extent could the achieved results have been delivered using fewer financial resources (minimum principle)?
- To what extent could the results (at outcome level) been maximized using the same amount of financial resources (maximum principle)?

OECD – DAC Criteria Impact

Dimension 1: To what extent have the intended higher-level development changes taken place or are expected to take place in the near future?

- To what extent can the higher-level development changes to which the intervention is designed to contribute be identified?
- To what extent can the higher-level development changes (social, economic, environmental dimensions and the interactions between them) be identified/foreseen at the level of the intended beneficiaries?
- To what extent are there positive interactions or trade-offs between social, economic and environmental changes? To what extent has the intervention contributed to higher-level development results at the level of particularly disadvantaged or vulnerable groups?

Dimension 2: To what extent have the results achieved by the intervention (at outcome level) contributed to the intended or implemented higher-level changes.

- To what extent has the intervention plausibly contributed to the identified and foreseeable higher-level development changes (Core question for evaluation)? Which

internal and external factors were decisive for the achievement/non-achievement of the intervention's intended development changes?
- To what extent did the intervention serve as a model or achieve broad-based impact? To what extent has the intervention contributed to structural or institutional changes (e.g. for organizations, institutions, systems and regulations)?

Dimension 3: To what extent has the intervention contributed to positive and not to negative unintended higher-level development changes?

- To what extent has the intervention contributed to positive and not to negative unintended higher-level development changes?
- To what extent has the intervention contributed to negative unintended higher-level development changes? Are there negative trade-offs between the impacts of the economic, social and environmental dimensions? Has the intervention taken adequate measures in order to prevent or counter the negative impacts and trade-offs?

OECD – DAC Criteria Sustainability

Dimension 1: To what extent do the partners, target groups and organizations involved have the capacities required to ensure that positive results are continued?

- To what extent do the beneficiaries and stakeholders (partners, target groups and organizations) have the institutional, human and financial resources as well as the willingness (ownership) required to sustain the positive results of the intervention over time (once assistance has ended)?
- To what extent do the partners, target groups and organizations have the required capacities (e.g. mandate, access to information, resources, power and influence, organization level, etc.) to successfully counteract existing or foreseeable risks (resilience)?

Dimension 2: To what extent has the intervention considerably contributed to the capacity of partners, target groups and other organizations involved to continue the positive results?

- To what extent and how has the intervention contributed to the beneficiaries and stakeholders (partners, target groups and organizations) having the institutional, human and financial resources as well as the willingness (ownership) required to sustain the positive results of the intervention over time even after assistance has ended and, if applicable, to alleviate the negative results?
- To what extent and how has the intervention contributed to strengthening the resilience of the partners, target groups and organizations involved? To what extent are particularly disadvantaged groups (these may be broken down by age, income, gender, ethnicity, etc.) among those?

Dimension 3: To what extent are the results of the intervention durable?

- To what extent can the results of the intervention – under the prevailing conditions – be deemed durable? (Core questions for evaluation)
- Which risks and potentials having emerged in the context of the intervention can secure the intervention's benefits in the long term? How probable is it that these factors will really occur? Has the intervention addressed those factors appropriately