

Project

Towards a better understanding of Amazonian Aquifer Systems for their protection and sustainable management

GEF ID 11108

Component 1

Terms of Reference (ToR)

Output 1.1.1: *An assessment of current state of the groundwater resources building inter alia on geological, geophysics, hydraulics, hydrodynamic, hydro-chemical, isotopic hydrology, and hydrogeological studies*

Project No.: GEF ID 11108

Funding Agency: IDB-UNEP

Executing Agency: Amazon Cooperation Treaty Organization (ACTO)

TERMS OF REFERENCE

Output 1.1.1: An assessment of current state of the groundwater resources building inter alia on geological, geophysics, hydraulics, hydrodynamic, hydro-chemical, isotopic hydrology, and hydrogeological studies

1. Background

The project “*Towards a better understanding of Amazonian Aquifer Systems for their protection and sustainable management*”, funded by the Global Environment Facility (GEF ID 11108), executed by the Amazon Cooperation Treaty Organization (ACTO), and having the Inter-American Development Bank (IDB) and the United Nations Environment Programme (UNEP) as implementing agencies.

Beneath much of the Amazon basin lies the Amazon Aquifer Systems (AAS). While presumably it underlies parts of Bolivia, Brazil, Colombia, Ecuador, Peru and Venezuela, its actual extent and dynamics are not well understood, and it is anticipated that it could extend much further than is currently known. The demand for safe water has increased in the Amazon Basin and, despite the large volume of surface water in the region, all countries use groundwater extensively as an alternative source of safe water. Groundwater in the Amazon basin plays a major role in the hydrological and ecological cycles and largely influences rainforest ecosystems and climate variability, especially during the dry season, where the understanding of surface-groundwater interactions is important. Groundwater is locally threatened by global changes such as climate change and extreme events affecting aquifer levels, recharge, and changes in groundwater regimes, as well as anthropogenic activities affecting water quality of aquifers. Global changes combined to population and economic activities growth and occurrence of diseases (Covid-19), dependency on groundwater supply increases, demanding sustainable and transboundary management strategy.

The project seeks to tackle four barriers: 1) *the insufficient transboundary aquifer knowledge*: the limits, the hydraulic behavior and interconnections between the regional geological formations, between surface and groundwater flows and potential hazards to groundwater are poorly understood, 2) *the lack of agreements for shared groundwater governance*: there is a gap in the different political, legal, regulatory, and institutional frameworks between countries for the management of groundwater systems, as well as the lack of understanding of the importance of cooperation to address the challenges that affect the AAS, 3) *the lack of a common protection strategy*: countries have advanced in the protection of groundwater through national strategies, plans, projects, and technical studies, but so far, no common strategy exists that is coordinated among those countries at the AAS scale, and 4) *the lack of public awareness related to AAS's protection and sustainable use*: there is a limited appreciation for the multiple services that the AAS provide at all levels (ecosystems, society, scientific community, etc.).

To tackle these four barriers, the project includes five (5) components:

Component 1: Consolidation and expansion of the current understanding in the functioning of and threats to the Amazon Aquifer Systems (AAS). This component includes 5 Outputs.

Component 2: Towards a multilevel management system for the AAS. This component includes 4 Outputs.

Component 3: Pilots for improved transboundary groundwater management. This component includes 8 pilots.

Component 4: Development of a Strategic Action Program for the AAS, including the country's action plan. This component includes 3 Outputs.

Component 5: Reinforced institutional capacity, gender mainstreaming, communication and awareness raised on the AAS. This component includes 4 Outputs.

2. Justification and theory of change

Due to both naturally occurring and human-induced contamination of surface waters, groundwater has become the only source of water of acceptable quality for many Indigenous Peoples and local communities living in riverine areas. Groundwater is also essential to food security, as it is used for agricultural irrigation and industrial water supply.

The countries of the Amazon Basin bear a major responsibility for safeguarding the groundwater systems that contribute to flows throughout the Basin, play a critical role in hydrological and ecological cycles, and constitute a strategic resource for humanity. However, the expansion of the agricultural frontier, large-scale infrastructure development, deforestation, illegal mining, and other pressures threaten the forests, water resources, and communities of the region.

The Amazon Aquifer Systems Project (AAS) was developed to support the strengthening of national and regional frameworks for the protection and sustainable use of the Amazon Aquifer Systems. This will be pursued by supporting dialogue and agreements to coordinate actions, harmonize approaches, and exchange information; establish and maintain groundwater monitoring networks; regularly update hazard, vulnerability, and risk maps; improve groundwater management; and develop recommendations for groundwater allocation and protection in accordance with each country's priorities.

Without an adequate and up-to-date assessment of the characteristics of the AAS to inform sustainable strategies for their use and management—and without appropriate legal, regulatory, and institutional frameworks for groundwater—global social and economic development objectives, including Sustainable Development Goal targets 6.4 and 6.6, will remain out of reach. Moreover, the degradation of water resources and aquifers risks becoming irreversible. This issue is particularly urgent because, in recent years, the contribution of groundwater to aquatic ecosystems has become increasingly important during recurring drought periods in the Amazon Basin.

The long-term sustainability of water resources and ecosystem health in the Amazon Basin can therefore be achieved only through an adequate and shared understanding of regional groundwater, its characteristics, and the threats it faces across multiple scales and among key stakeholders. It will also require the establishment of a multilevel cooperation framework for these transboundary Amazonian aquifer systems—among the largest in the world—to ensure the water security of the populations that depend on them and to protect Amazonian ecohydrological systems and associated livelihoods. The Theory of Change of the AAS Project is found in Annex 1.

To provide recommendations on governance and institutional arrangements (White Paper, Component 2), to develop the Transboundary Diagnostic Analysis (TDA), detailed science-based studies using state-of-the-art methodologies ranging from remote sensing, in-situ field measurements and mathematical modeling of groundwater processes must be developed.

This consultancy is both timely and essential, as its evidence and recommendations are required to develop science-based activities and to provide guidance for the development of the TDA.

3. Consultancy Objectives

3.1. General Objective

To provide the state-of-the-art review, assessment and interpretation of the groundwater resources of the Amazon Aquifer Systems (AAS) building inter alia on geological, geophysics, hydrodynamic, hydro-chemical and hydrogeological studies, among others related studies. The review includes peer-reviewed publications, gray publications and national/regional data/information from the countries and other stakeholders regarding groundwater processes, monitoring activities and their protocols, in order to establish a sound scientific and technical basis for the characterization of the AAS, identification of knowledge and monitoring gaps, and definition of research and monitoring priorities.

3.2. Specific objectives

- To develop a detailed working plan defining the methodology, schedule, resources, information requirements, country coordination, and interlinkages among the products to achieve the objectives of this consultancy.
- To conduct a state-of-the-art review, synthesis and interpretation of physical characterization of the AAS, and identify gaps and opportunities (Activity 1.1.1.1).
- To conduct a state-of-the-art review, synthesis and interpretation of surface-groundwater interaction, including atmospheric and land surface processes under climate change conditions, and identify gaps and opportunities (Activity 1.1.1.2).
- To conduct a state-of-the-art review, synthesis and interpretation of existing ground-based and remote sensing-based monitoring efforts with estimation of water storage, water table, withdrawal, surface deformation, among other parameters, and identify of gaps and opportunities (Activity 1.1.1.3).
- To conduct a state-of-the-art review, synthesis and interpretation of groundwater processes at the scale covering the pilot sites (downscaling techniques in remote sensing), and description of gaps and opportunities (Activity 1.1.1.4).

4. Reports and expected products

4.1. Component 1, Output 1.1.1

Component 1: Component 1 develops science-based studies using in-situ- and remote sensing-based methodologies, considering global changes (climate and human-induced), considering socio-economic development scenarios, and using global models (atmospheric, surface and groundwater) to have a better understanding not only on the AAS's processes, but also of the major threats. For example, based on the physical characterization and human-induced hazards, priority zones will be identified (in terms of vulnerability, protection, data importance, potential unknown hazard to aquifer, etc.) for developing in-situ field measurements that will contribute to the AAS understanding. Three main features complementing Component 1 are: 1) provision of continuous training and capacity building to countries and ACTO with gender mainstreaming focus, where a certification in Amazon Aquifer Systems, groundwater knowledge and governance will be organized, 2) provision of science-based communications products, visualization and decision support tools/models, 3) development of Citizens Science initiatives that will provide engagement and awareness of local communities and sharing educational/communicational products, 4) the

development of scientific evidence through peer-reviewed publications, and 5) the development of a TDA (Transboundary Diagnostic Analysis).

Output 1.1.1: An assessment of current state of the groundwater resources building inter alia on geological, geophysics, hydrodynamic, hydro-chemical and hydrogeological studies. Existing studies shall be reviewed, assessed and interpreted to develop a sound scientific and technical basis for the determination of the main characteristics of the AAS, including existing in-situ- and remote sensing-based monitoring efforts. Gaps in the existing scientific knowledge, studies and available information, as well as opportunities for further research, will be identified and delineated.

The following activities are anticipated to be undertaken:

- **Activity 1.1.1.1:** State-of-the-art review, synthesis and interpretation of physical characterization of the AAS, gaps and opportunities. This activity will perform an assessment of the state-of-the-art scientific understanding using geological, geophysics, hydraulics, hydrodynamic, hydro-chemical, isotopic hydrology, and hydrogeological studies. Gaps and opportunities for performing research will be delineated.
- **Activity 1.1.1.2:** State-of-the-art review, synthesis and interpretation of surface-groundwater interaction, including atmospheric processes under land surface processes under climate change conditions, and description of gaps and opportunities. This activity will include atmospheric processes such as the flying rivers of the Amazon Rainforest (an important factor that modulates precipitation patterns) under land surface processes and climate change conditions.
- **Activity 1.1.1.3:** State-of-the-art review, synthesis and interpretation of existing in-situ-based and remote sensing-based monitoring efforts with estimation of water storage, water table, withdrawal, surface deformation, among other parameters, and description of gaps and opportunities. Inventory of ongoing monitoring infrastructure and data (aquifer geometry, aquifer recharge and discharge identification, lithology and soil type, porosity, permeability, transmissivity and vertical conductivity, flow direction, pH, salinity, among others). Remote sensing-based analysis will be performed to estimate groundwater storage, groundwater storage anomaly, trend and seasonal variations, as well as changes due to hydrologic stages.
- **Activity 1.1.1.4:** State-of-the-art review, synthesis and interpretation of groundwater processes at the scale covering the pilot sites (downscaling techniques in remote sensing), and identification of gaps and opportunities. The remote sensing-based analysis of Activity 1.1.1.3 will be downscaled from the AAS to pilot's scale.

4.2. Products, and Expected Results (in PDF and editable documents)

PRODUCT 1: Working plan that includes the schedule and detailed description of the working methodology along with resources to be used to achieve the contracted objective. The consultancy shall present the working plan in a report format, detailing the necessary methodology to achieve the general and specific objectives (of all products) of this ToR. The methodology shall address all general and specific objectives of this ToR and shall not modify, reduce, reinterpret, or exclude any contractual requirement.

The report relevant to this product shall include, at a minimum:

- 1.1. Methodology for inventorying/reviewing/interpreting and harmonizing national and regional information regarding the products (covering Output 1.1.1).
- 1.2. Detailed methodology for the requested products at the regional and national levels, including the standardization and integration of information and how they are interlinked, thus a road map to the TDA could be built.
- 1.3. Detailed timeline of activities (reports) including a plan of meetings with countries (if possible, specify potential requests of information). All the products require a validation workshop with country members. Reports (English and Spanish) need to be sent to countries at least two weeks in advance, therefore planning of meetings with countries regarding each product should be carefully designed.

Notes:

- Products from ongoing efforts (European Space Agency, International Atomic Energy Agency, French National Research Institute for Sustainable Development – IRD, among others) will be shared to the consultants.
- Data/information from countries: the working plan and the following products must include interaction with all eight ACTO Member Countries through the PCU. National data, maps, and interpretations must be coordinated with and/or reviewed by the officially designated country experts or focal points. Any missing information or unresolved technical differences should also be documented.

PRODUCT 2: State-of-the-art review, synthesis and interpretation of the physical characterization of the AAS, and identification of gaps in existing scientific knowledge, studies, and information, and opportunities for further research. This activity will assess the state-of-the-art scientific understanding based on geological, geophysics, hydraulics, hydrodynamic, hydro-chemical, isotopic hydrology, and hydrogeological studies.

The report relevant to this product shall include, at a minimum, the following information:

- 2.1. **State-of-the-art review, synthesis and interpretation:** comprehensive assessment of the current scientific (peer-reviewed publications) and technical understanding of the AAS using peer-reviewed publications, gray literature, national and regional information as sources, covering geological, geophysical, hydraulic, hydrodynamic, hydrochemical, isotopic hydrology, and hydrogeological studies and data.
- 2.2. **Integrated hydrogeological database and knowledge inventory:** georeferenced compilation, standardization and harmonization of existing geological, geophysical, hydrogeological, groundwater, hydrochemical, isotopic, and hydraulic data and studies from participating countries. Differences in scales, classifications, units, terminology, and other relevant aspects affecting regional comparability shall be documented. The data should be formatted according to specifications from the Amazon Regional Observatory (ARO).
- 2.3. **AAS's conceptual model and maps:** integrated conceptual and spatial characterization, of aquifer architecture, groundwater flow, recharge/discharge, groundwater–surface-water interactions, and areas of uncertainty. Assumptions and limitations resulting from data and knowledge gaps shall be documented.

- 2.4. Knowledge and data gap assessment:** identification and, where applicable, spatial delineation of major gaps in existing scientific knowledge, studies, data availability, geographic coverage, methodologies, and monitoring that limit the current understanding of the AAS.
- 2.5. Priority research and monitoring agenda:** prioritized portfolio of research and monitoring opportunities, including recommended methodologies, priority areas, and sequencing of activities.
- 2.6. Research roadmap:** strategic roadmap translating the scientific findings into actionable recommendations for future research, monitoring, data integration, and sustainable groundwater management.

Note: Provide an executive report as a presentation (Power Point or similar) to the countries.

PRODUCT 3: State-of-the-art review, synthesis and interpretation of surface-groundwater interaction, including atmospheric processes under land surface processes under climate change conditions, identification of gaps in existing scientific knowledge, studies and information, and opportunities for further research. This activity will include atmospheric processes such as the flying rivers of the Amazon Rainforest (an important factor that modulates precipitation patterns) land surface processes and climate change conditions (Activity 1.1.1.2).

The report relevant to this product shall include, at a minimum, the following information:

- 3.1. Integrated state-of-the-art assessment:** review of surface-groundwater interactions and their relationships with atmospheric and land-surface processes across the Amazon, using peer-reviewed publications, gray literature, and national and regional information as sources.
- 3.2. Atmosphere, surface, and groundwater conceptual model:** integrated conceptualization, based on available information and data, of precipitation, evapotranspiration, atmospheric moisture transport (“flying rivers”), soil processes, groundwater recharge, river discharge, groundwater–surface-water (global) exchanges, and monitoring aquifer data. Description of spatiotemporal scales addressing the interaction of these processes should be included. Relevant spatial and temporal scales and areas of uncertainty shall be described.
- 3.3. Integrated geospatial database and maps:** compilation, standardization, harmonization and spatial analysis of atmospheric, climate, land-surface, hydrological, hydrogeological, and remote-sensing datasets, including maps of priority interaction and vulnerability zones. Differences affecting regional comparability shall be documented. The data should be formatted according to specifications from ARO.
- 3.4. Climate and land-use change assessment:** assessment, based on existing studies and available information, of how climate change, deforestation, forest degradation, and other land-surface changes may affect atmospheric moisture recycling, precipitation, groundwater recharge, surface runoff, river flows, and groundwater–surface-water interactions.
- 3.5. Gaps, uncertainties, and opportunities assessment:** identification of major gaps and uncertainties in existing scientific knowledge, studies, observation, data, and modeling related to surface-groundwater interactions, including priority areas where additional research is required.

3.6. Integrated research and monitoring roadmap: prioritized recommendations for coupled atmosphere–surface–groundwater modeling under future climate scenarios.

Note: Provide an executive report as a presentation (Power Point or similar) to the countries.

PRODUCT 4: State-of-the-art review, synthesis and interpretation of existing in-situ-based and remote sensing-based monitoring efforts, including estimation of water storage, water table, withdrawal, surface deformation, among other parameters, and identification of gaps and opportunities. An inventory of existing-ongoing monitoring infrastructure and data (aquifer geometry, aquifer recharge and discharge identification, lithology and soil type, porosity, permeability, transmissivity and vertical conductivity, flow direction, pH, salinity, among others) shall be conducted. Remote sensing-based analysis shall be performed to estimate groundwater storage, groundwater storage anomaly, trend and seasonal adjustments, as well as changes due to hydrologic stages (Activity 1.1.1.3).

The report relevant to this product shall include, at a minimum, the following information:

- 4.1. Inventory and assessment of existing monitoring infrastructure:** comprehensive georeferenced inventory of existing in-situ and remote-sensing monitoring efforts, infrastructure, datasets, measured parameters, spatial and temporal coverage, monitoring frequency, and data accessibility. A detailed inventory from country members is required.
- 4.2. Integrated hydrogeological monitoring database:** structured, georeferenced and harmonized database of available groundwater levels, withdrawals, recharge/discharge indicators, aquifer geometry and properties, lithology, soil characteristics, hydraulic parameters, hydrochemistry, surface-water observations, and surface-deformation information. Data sources, units, temporal and spatial references, and relevant limitations shall be documented. The data shall be formatted according to specifications from the Amazon Regional Observatory (ARO).
- 4.3. Groundwater storage and storage-anomaly assessment:** Regional remote-sensing-based analysis and estimates of groundwater storage and groundwater storage anomalies, including spatial patterns, long-term trends, seasonal variability, and interannual changes.
- 4.4. Groundwater dynamics and hydrologic-stage assessment:** Analysis of groundwater responses to seasonal and interannual hydrologic stages, including floods, droughts, recharge periods, low-flow conditions, and other hydrological extremes.
- 4.5. Integrated monitoring and data-gap assessment:** Integration and, where technically feasible, validation of in-situ and remote-sensing observations, with identification of spatial, temporal, and parameter-specific monitoring gaps and priority areas for additional observations. Discussion on monitoring protocols for groundwater processes are required. Existing groundwater monitoring protocols and differences among countries shall be assessed and documented.
- 4.6. AAS monitoring strategy and roadmap:** Recommendations for an integrated long-term monitoring system combining wells, hydrological stations, geophysics, satellite gravimetry, remote sensing, and other technologies, including priority locations, parameters, frequency, standards, and data-management procedures.

Note: Provide an executive report as a presentation (Power Point or similar) to the countries.

PRODUCT 5: State-of-the-art review, synthesis and interpretation of groundwater processes at the scale of the eight pilot sites (downscaling techniques in remote sensing) and description of gaps and opportunities. The remote sensing-based analysis of Activity 1.1.1.3 will be downscaled to the AAS to pilot's scale (Activity 1.1.1.4). There are eight pilots, and the sub-basin scales around the pilots (shapefiles) will be shared to the consultants. This product will be considered as initial assessments for the 8 pilots. Separate reports for each pilot are expected.

The report relevant to this product for each pilot shall include, at a minimum, the following information:

- 5.1. Pilot-site groundwater process assessment:** detailed assessment and interpretation of groundwater recharge, discharge, storage dynamics, water-table fluctuations, and groundwater-surface-water interactions at the spatial scale of the selected pilot sites.
- 5.2. High-resolution downscaled groundwater products:** spatially and temporally enhanced estimates of groundwater storage, groundwater storage anomalies, and, where feasible, groundwater-level/water-table variations derived through remote-sensing downscaling techniques.
- 5.3. Integrated remote-sensing and in-situ dataset:** harmonized pilot-site datasets integrating satellite observations, groundwater monitoring, hydrological observations, climate variables, land-surface characteristics, and hydrogeological information.
- 5.4. Validation, uncertainty, and performance assessment:** Evaluation of the accuracy, uncertainty, limitations, and transferability of the downscaled groundwater products using available in-situ observations.
- 5.5. Pilot-site downscaling methodology and scaling roadmap:** documented methodology and recommendations for applying the downscaling approach to other Amazon regions (priority zones in Output 1.1.2), including required datasets, monitoring infrastructure, processing methods, and other relevant themes.
- 5.6. Gaps and opportunities (based on pilot's technical proposal):** Based on the available information, describe the gaps and opportunities of groundwater monitoring and analysis at the scale surrounding the pilots, having the country's technical proposal as baseline.

Note: Provide an executive report as a presentation (Power Point or similar) to the countries.

5. Product presentation format

The products must be delivered observing the following details:

- Reports of each product shall be submitted in English and Spanish versions, in editable format and PDF.
- As applicable to each product, the consultant shall provide the data and databases used and generated during the analysis in structured and editable formats (e.g., Excel, CSV, or other appropriate formats). Data shall be organized and documented according to the specifications of the Amazon Regional Observatory (ARO) and the Project Data Management Plan. The corresponding metadata shall be provided, including, as applicable, data source, description, units, spatial and temporal reference, processing or transformation applied, and relevant limitations.
- Maps and geospatial datasets used or generated under the consultancy shall be delivered in editable GIS-compatible formats, including associated attribute tables, coordinate reference system information, metadata, and other supporting information necessary for

their interpretation and reuse. Raster and vector data shall be provided in appropriate standard geospatial formats according to ARO specifications and the Project Data Management Plan.

- A structured and editable bibliographic database shall be provided, containing the peer-reviewed publications, gray literature, technical reports, national and regional information, and other documentary sources reviewed for the consultancy. At a minimum, the database shall identify the reference, type of source, year, geographic coverage, thematic area, and access or source information, where available.
- All figures, graphs, diagrams, conceptual models, and other graphical elements produced for the reports shall also be delivered in editable or reproducible formats, together with the underlying data used for their preparation, where applicable.
- Remote sensing datasets and derived products generated under Products 4 and 5, including maps, raster datasets, time series, groundwater storage estimates, groundwater storage anomalies, and downscaled products, shall be delivered in appropriate editable or reusable formats, together with the corresponding metadata and methodological documentation.
- A summary presentation of each product shall be submitted in editable PowerPoint format in both English and Spanish.

NOTE: All digital files shall be clearly organized by product and accompanied by sufficient documentation to ensure their traceability, interpretation, reproducibility, and subsequent use by ACTO, ARO, the participating countries, and subsequent Project activities.

6. Supervision and Reporting

The consultancy will be coordinated by the Amazon Cooperation Treaty Organization (ACTO) through the Project Coordination and the designated technical team. The project counterpart will guarantee availability for coordination meetings, delivery of required information and documents, as well as timely validation of the products.

7. Location and working arrangement

The Consultant (institution/company) will provide services in his own offices and will maintain virtual contact with the Project Coordination Unit (PCU). Travel, in-person consultations or validation workshops may be required only when agreed in advance and reflected in the approved work plan and financial proposal.

8. Working methodology

The consultant will apply a participatory and iterative methodology, which will include:

- Initial meeting for scope and schedule validation.
- Progressive deliveries per product.
- Review and feedback rounds.
- Final validation by the designated technical supervisor.
- Formal delivery of final editable products.

9. Deliverable and payment schedule (after contract), remuneration per product

Product	Deadline (after contract)	Payment (% of total)
Product 1	Week 2	10%

Product 2	Month 3	20%
Product 3	Month 5	25%
Product 4	Month 7	25%
Product 5	Month 9	20%

10. Confidentiality and Intellectual Property

The handling of information shall be subject to the confidentiality policies of UNEP and the PS/ACTO; prior to disclosing internal documents—or documents that, by virtue of their content or the circumstances of their creation or communication, must be considered confidential—express written consent must be obtained from UNEP through the PS/ACTO, acting as the executing entity.

Copyright and other intellectual property rights in materials produced under this consultancy shall be determined in accordance with the Project Cooperation Agreement between UNEP and PS/ACTO and reflected in the consultancy contract. The consultant shall not publish, distribute or reuse the products without prior written authorization from PS/ACTO and UNEP, as applicable. Pre-existing information, data, maps, methodologies and other materials shall remain the property of their original owners. Data provided by participating countries or partner institutions shall be used and shared only in accordance with the conditions established by the respective data owners. All sources, licenses, restrictions and required acknowledgements shall be clearly documented in the products and associated metadata.

11. Submission of Proposals

Proposals must include at least:

- Resume (CV) or institutional profile (if it is a company).
- Portfolio of relevant works.
- Technical proposal: methodology, schedule and work approach.
- Economic proposal: total amount and breakdown by product.
- Estimated implementation schedule.

Proposals should be sent to the following email address: proyectosaa@otca.org

12. Evaluation criteria

Criterion	Weighting
General experience of the consultant/company in the activities proposed in each product	20%
Technical profile of the team	30%
Technical proposal	30%
Economical proposal	20%

13. Requirements

Number	Criteria (yes/no)
1	The company must be registered in its country to carry out the specific consulting work.

2	At least three (3) projects carried out by the company/institution in the last ten (10) years related to the subject matter of the consultancy.
3	The professionals on the company/institution's technical team must have at least 10 years of experience for the coordinator and at least 5 years for the specialists, in areas related to the subject matter of the consultancy. All professionals involved must hold a university degree. The coordinator must hold a PhD's degree in a related field. The other members of the team must be experts on the field, preferable with Master and PhD degrees.
4	Among the team's professionals, the coordinator and the specialists must possess demonstrated experience in the Amazon region ranging from geology, climatology, hydrology, hydrogeology, water resources, or other related field to the subject matter of the consultancy.
5	Among the team's professionals, proficiency in Spanish and English should be demonstrated (important for meetings with CM).
6	Submission of the company profile, individual team CVs, technical proposal, and financial proposal.

Annex 1: Theory of change

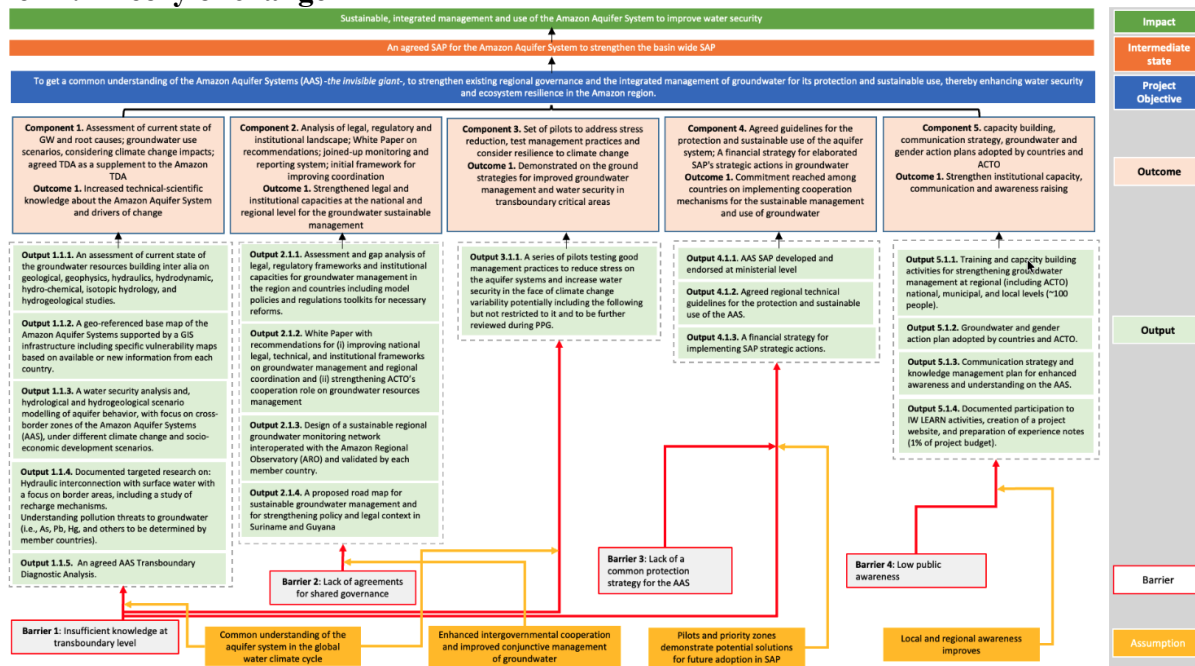


Figure 1: Theory of change – AAS Project

Figure 1 shows the sequence from barriers, to Outputs, to Outcomes and Components, thus, to achieve the project objective. On this regard, and to advance the implementation of Component 1, an assessment of current state (baseline) of the groundwater resources building inter alia on geological, geophysics, hydrodynamic, hydro-chemical and hydrogeological studies will be carried out (herein Output 1.1.1).

Annex 2: Suggested expertise for the consultant team

The consultant team shall be multidisciplinary and collectively cover, at a minimum, the following areas of expertise:

- **Groundwater and geological expertise:** hydrogeology, aquifer characterization, groundwater modeling, hydrochemistry and isotope hydrology.
- **Hydrological and climate expertise:** surface–groundwater interaction, hydrology, ecohydrology, atmospheric science, Amazon moisture recycling and climate modeling.
- **Earth observation expertise:** remote sensing, satellite gravimetry, hydrological remote sensing and remote-sensing downscaling.
- **Data and integration expertise:** GIS, spatial analysis, database management, statistical analysis, uncertainty assessment and integration of multi-source datasets.

Individual experts may cover more than one area of expertise, provided that the consultant demonstrates that the team collectively has the qualifications and experience required to satisfactorily perform all activities and products under this ToR.