Kathmandu Valley Water Supply Management Board
Kathmandu Valley Water Security Improvement Project (KV WaSIP)
Grant Facility for Project Preparation (GFPP)
Terms of Reference for Recruitment of a
Senior Hydrologist

Position	Senior Hydrologist
Duty Station	Kathmandu, Nepal with frequent visit to project site
Contract Duration	15 months
Full Time/Intermittent	Full time
Expected Start Date	October 2026

1. Context

Kathmandu Valley anchors Nepal's aspiration for double-digit, jobs-led, inclusive growth. Kathmandu Valley (KV) is Nepal's capital region and home to more than 3 million people. KV is among the fastest growing metropolitans in South Asia, expected to reach 4.5 million by 2041. KV houses a quarter of Nepal's formal jobs, and nearly one in five businesses, and contributes over a third of national GDP (and higher if excluding remittances). KV is already driving Nepal's job-led growth, providing over a quarter of nonfarm employment in promising sectors such as ICT and tourism (KV houses 61% of ICT jobs, and is the gateway to Nepal). But systemic challenges in KV's urban infrastructure and institutions will limit future growth if unaddressed, including heavy traffic congestion and inadequate road infrastructure; limited urban planning and resilient public spaces; a lack of reliable waste management, with almost no wastewater treatment; and a severe water supply shortage.

KV's water supply faces the double challenge of insufficient bulk water and low resilience. Current water supply to the core city is estimated to be about a third of expected demand (average water supply remains around 40 liters per capita per day (lpcd), significantly below the planning standard of approximately 130 lpcd required to ensure adequate and reliable urban service levels). As a result, most households receive water for only about 2 hours a few times a week. The majority of bulk water comes from the Melamchi system, which delivers about 170 million liters per day for part of the year, with plans to increase this supply over the next decade to 510 million liters per day. While reliable estimates of demand have not been conducted, current demand is likely around 490 million liters per day and is expected to increase as the capital's population and economic development grow. Reliance on a single source of bulk water increases the overall vulnerability of KV's water system to disasters, and there is a growing need to increase resilience through additional bulk water options in the event that the Melamchi catchment or bulk water system is affected, as was the case in the 2021 cascade disaster.

The cost of an inadequate water supply is high. Households and businesses supplement municipal water supply through groundwater, public taps, rainwater, or tankers, where possible. People pay up to 4 times the price of public piped water to buy water from vendors. Groundwater has been an overexploited lifeline to the valley, but it faces equity and environmental issues: deep tubewells that hotels, housing colonies, and industries can afford have begun to deplete water tables, drying out shallow tubewells that households rely on and causing land subsidence in parts of the city. The hidden cost of unsafe water is also high. Waterborne diseases are a significant public health concern in KV, with over 60% of households consuming sewage-contaminated water containing E. coli. Common illnesses include typhoid, diarrhea, cholera, dysentery, and jaundice. Risk peaks during the monsoon season (March–September), and contaminated groundwater and jar or tanker water are major sources of infection.

2. Project Description

The proposed KV WaSIP aims to enhance the availability, reliability, and climate resilience of potable bulk water supply for the Kathmandu Valley through the development of a regulated storage-based source on

the Sisneri River in Makawanpur District. The Project responds to the limitation of available river flows, which are insufficient to sustain a run-of-river supply system during the dry season. Earlier studies under the Bagmati River Basin Integrated Master Plan, together with subsequent feasibility and preliminary design work, identified the Sisneri River as a technically viable and strategically important source for augmenting the Valley's bulk water supply.

Based on the latest feasibility assessments, the preferred scheme comprises a storage dam located upstream of the Kogate–Sisneri confluence, with a preliminary crest length of approximately 162 meters and a height of approximately 65 meters. The reservoir is expected to provide an estimated gross storage capacity of approximately 17.77 million cubic meters, including a live storage volume of approximately 15.35 million cubic meters. Preliminary operating levels are defined between a minimum drawdown level of approximately 1,124 masl and a maximum pool level of approximately 1,157 masl. Subject to hydrological conditions, system optimization, and operating rules, the scheme is expected to supply up to approximately 140 MLD during the wet season and approximately 80 MLD during the dry season.

Reservoir regulation is central to the Project design, enabling the capture and regulation of monsoon flows to improve dry-season supply reliability and strengthen long-term water security. Reservoir operations will need to account for environmental flow requirements, sediment management, flood routing, reservoir filling procedures, spillway and outlet operating rules, and potential source augmentation through diversion from the Kogate River and, if required, the Kulekhani Reservoir system. The Project will also include reservoir operation and water balance models to assess system yield under different hydrological and climate scenarios and to establish safe, efficient, and sustainable operating parameters.

The proposed infrastructure includes the dam and reservoir, a dam-integrated raw water intake structure, possible source augmentation works linked to the Kogate River and Kulekhani Reservoir system, and associated ancillary infrastructure, including spillway and outlet works, access roads, power supply, construction camps and staging areas, and administrative and operational facilities. The wider bulk water supply system is expected to include transmission and pumping infrastructure connecting the scheme to downstream treatment and storage facilities, including conveyance arrangements linked to the Sainbu Reservoir system. The intake is proposed to be integrated into the dam structure and designed to accommodate the planned bulk water supply capacity.

Given that earlier investigations were based on limited field data and preliminary site characterization, further technical investigations and validation will be required before final design. These will confirm key hydrological, geological, geotechnical, hydraulic, sedimentation, dam safety, and climate resilience assumptions. The Project will therefore include feasibility confirmation and optimization of dam and reservoir alternatives, followed by detailed engineering design, cost estimates, implementation planning, operation and maintenance arrangements, dam safety documentation, environmental and social risk management inputs, and bidding documents to support construction and implementation.

3. Objectives of the Assignment

As a team member of the Project Management Unit (PMU), the overall objective of the assignment is to provide specialist hydrological, hydraulic, sedimentation, and climate resilience support to the PMU for the feasibility confirmation, detailed design, and implementation readiness of the Sisneri Dam and associated bulk water supply system. The Senior Hydrologist will help ensure that the Project's hydrological basis, reservoir yield assumptions, flood safety provisions, sediment management approach, and climate risk considerations are technically sound, robust, and consistent with international good industry practice and applicable World Bank requirements.

4. Scope of Services

Specific tasks and responsibilities include, but are not limited to, the following:

- Prepare and agree with the PMU on a detailed work plan, methodology, and QA/QC framework for reviewing hydrological, hydraulic, sedimentation, climate resilience, and reservoir operation studies, ensuring alignment with the Consultant's scope of services, project schedule, applicable national regulations, World Bank requirements, international good industry practice, and relevant dam safety guidelines.
- Review[1], verify, and provide technical advice on hydrological investigations and analyses, including rainfall assessment, streamflow data collection and validation, flow record extension, rating curve development, regional hydrology, low-flow assessment, long-term flow generation, water balance analysis, water availability assessment, reservoir inflow analysis, and dry-season yield reliability.
- Review the adequacy, reliability, and consistency of hydrological datasets, assumptions, statistical methods, modelling approaches, and adopted design criteria, including the treatment of uncertainty, data gaps, outliers, non-stationarity, climate variability, climate change, and sensitivity testing.
- Review design storm and flood studies, including design storm estimation, probable maximum precipitation, probable maximum flood, design flood derivation, flood hydrograph development, and flood frequency analysis for the dam, diversion works, spillways, outlet works, intake structures, access roads, flood protection works, and associated infrastructure.
- Review hydraulic assessments and design assumptions for the dam and appurtenant structures, including reservoir routing, spillway sizing and operation, outlet works, diversion tunnels or channels, construction-stage flood handling, energy dissipation arrangements, downstream scour protection, river training works, and safe conveyance of extreme flood events.
- Review catchment and watershed assessments, including land use and land cover change, erosion and sediment source characterization, landslide susceptibility, upstream development pressures, climate variability, catchment degradation, and other factors that may affect runoff response, sediment yield, water quality, reservoir sustainability, and long-term dam performance.
- Review reservoir operation studies, simulation models, and proposed operating rules, including yield and reliability analysis, storage allocation, environmental and minimum downstream flow requirements, initial reservoir filling procedures, operational rule curves, flood management, drought management, conjunctive operation with other water supply sources, and performance under alternative hydrological and climate scenarios.
- Review sediment investigations and sediment management studies, including sediment sampling and monitoring programs, sediment rating curves, sediment yield modelling, reservoir sedimentation analysis, delta progression, trap efficiency, sediment flushing or sluicing options, and implications for live storage loss, intake performance, water quality, reservoir life, and long-term operational sustainability.
- Review and advise on hydro-meteorological monitoring systems and field investigation programs, including stream gauging, rainfall and climate monitoring networks, telemetry systems, sediment monitoring, instrumentation requirements, data management systems, QA/QC procedures, and additional investigations or long-term monitoring required for detailed design and future reservoir operation.
- Review dam-break assessments, downstream flood routing, inundation mapping, flood hazard classification, flood warning requirements, emergency preparedness and response planning, and downstream risk assessments, including the adequacy of modelling assumptions, breach parameters, scenarios, warning times, exposure analysis, and proposed mitigation measures.

[1] For the purposes of this TOR, "review" means the systematic examination of a document, design, deliverable, or process to assess its quality, completeness, accuracy, consistency, and compliance with applicable requirements, and to provide clear comments and recommendations for improvement, where needed.

- Assess the potential implications of climate change on hydrology, flood magnitude and frequency, drought risk, reservoir yield, sediment dynamics, water availability, and operational reliability, and advise on appropriate climate adaptation and resilience measures to be incorporated into project design and operation.
- Provide hydrological and hydraulic inputs to dam safety planning, including flood handling capacity, reservoir filling, operational restrictions, instrumentation and monitoring needs, emergency drawdown considerations, flood warning arrangements, and coordination between reservoir operation rules and emergency preparedness procedures.
- Review hydrology, hydraulics, sedimentation, and reservoir operation inputs to technical reports, models, calculations, drawings, specifications, cost estimates, implementation schedules, and bidding documents, and provide independent technical comments and recommendations to ensure that outputs are technically sound and suitable for procurement and implementation.
- Support the PMU in reviewing construction-phase hydrology and temporary works requirements, including river diversion design, cofferdam flood criteria, construction flood risk, seasonal work planning, temporary drainage, sediment and erosion control, and contractor obligations for flood preparedness and monitoring.
- Coordinate closely with dam, hydraulic, geotechnical, structural, environmental, social, climate, water treatment, conveyance, and distribution specialists to ensure that hydrological and hydraulic considerations are fully integrated into feasibility confirmation, detailed design, dam safety, environmental and social risk management, construction planning, and operational strategy.
- Identify and recommend additional investigations, analyses, design refinements, monitoring improvements, operational procedures, institutional strengthening measures, training needs, or capacity-building activities required to support sustainable reservoir operations, long-term dam safety, climate resilience, and effective water resources management.
- Provide structured review comments, technical briefs, practical recommendations, and knowledge transfer support to strengthen PMU decision-making and improve the quality, usability, and implementation readiness of hydrology-related project outputs.

5. Expected Outputs

The Senior Hydrologist will be responsible for the following key deliverables:

- Technical review and validation of hydrological, hydraulic, flood, and reservoir operation studies and designs.
- Review of sedimentation, watershed, erosion, and reservoir sustainability assessments.
- Climate change and resilience assessment with recommendations for adaptation measures.
- Review of dam safety studies, dam-break analysis, flood risk assessments, and emergency preparedness plans.
- Review of hydro-meteorological monitoring systems, instrumentation, and data management arrangements.
- Technical review of reports, designs, specifications, cost estimates, and bidding documents, with recommendations for improvement.

6. Qualifications and Experience Requirements

All applications will be evaluated against the assignment's required qualifications (Table 1).

Candidates who comply with the qualifications will be scored according to predefined criteria. A minimum of three candidates will be shortlisted and interviewed. The candidate with the highest score will be invited to negotiate a contract. Referees of the selected candidate may be contacted to verify prior experience, performance, and interpersonal skills.

The Senior Hydrologist shall possess strong academic qualifications and demonstrated professional experience relevant to dam hydrology, sediment management, hydraulic analysis, and reservoir operations for large water infrastructure projects. The expert should have proven capability to review and guide hydrological investigations, assess design assumptions and modelling outputs, and provide technical advice on dam safety, flood management, sedimentation, and climate-related risks in the context of feasibility updating and detailed engineering design.

Table 1. Qualifications and Relevant Experience

Education	• The expert shall hold at least a bachelor's degree in water resources engineering, hydrology, civil engineering, or a related discipline. • A master's degree in hydrology, water resources, hydraulic engineering, or a closely related field is required, and a PhD will be considered an added advantage.
Work Experience	• At least 15 years of relevant professional experience in hydrological assessment, hydrological modelling, flood estimation, sediment studies, reservoir operation analysis, and review or design support for dam or major water resources infrastructure projects. • The expert shall demonstrate strong experience in hydrological data collection, interpretation, and modelling, including rainfall and streamflow analysis, rating curves, long-term flow generation, design flood estimation, probable maximum flood assessment, and flood routing for dams and associated hydraulic structures. • The expert shall have proven expertise in sediment assessment, reservoir sedimentation and management, reservoir operation studies, water availability and dry-season yield analysis, minimum release requirements, and evaluation of climate variability and climate change impacts on hydrological performance. • The expert shall have sound knowledge of hydrology-related dam safety, including dam-break analysis, emergency preparedness planning, downstream flood routing, inundation mapping, and risk mitigation, and experience coordinating with multidisciplinary dam or water supply teams; prior review, advisory, quality assurance, or panel-type roles will be an advantage.
Interpersonal Skills	• The expert shall have strong analytical, report writing, and communication skills, and shall be able to communicate clearly and effectively in spoken and written English.

7. Evaluation and Selection Method

The Senior Hydrologist will be hired by the PMU using the Open Competitive Selection of Individual Consultants method following "**World Bank Procurement Regulations for Investment Project Financing Goods, Works, Non-Consulting and Consulting Services**" (July 2016) Seventh Edition 2025. [2]

The attention of interested Consultants is drawn to Section III, paragraphs 3.14, 3.16, and 3.17 of the World Bank's "Procurement Regulations".

8. Duration of the Assignment

[2] The World Bank Procurement Regulations can be accessed via this link.

The Senior Hydrologist will perform the scope of these TORs for a duration of 15 months from contract signature on a full-time basis.

9. Remuneration

A market-based salary package commensurate with the candidate's experience and qualifications will be offered.

10. Reporting

The Senior Hydrologist will report directly to the Project Manager, PMU.

11. Location

- The consultant will be based at the PMU office and may be required to travel outside the valley as needed for project-related procurement activities.
- The Project shall provide following facilities to consultant during his tenure of service:
    - Office space
    - Email and internet access
    - Required office stationery and other materials
    - Photocopying/printing facilities

12. Application Process

Interested candidates shall submit a complete application package comprising:

(i) Up-to-date curriculum vitae (CV).
(ii) Copies of academic and professional certificates.
(iii) Contact details for at least three (03) professional references familiar with the candidate's relevant work.

Applications shall be submitted electronically no later than 11th September 2026 to the following e-mail address: sisnerikvwsmb@gmail.com. Only complete applications received by the deadline will be considered.