Government of Nepal
Ministry of Physical Infrastructure and Transport
Department of Roads
Development Cooperation Implementation Division

Strategic Road Connectivity & Trade Improvement Project (SRCTIP)

Notice No. SRCTIP/01/076-77

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Contract Identification Number: SRCTIP-DoR- KDP-CS-QCBS- 02

REQUEST FOR EXPRESSION OF INTEREST (REOI)

Date of first publication: **4th June, 2020**
Country: - Nepal
Name of project: Strategic Road Connectivity & Trade improvement project (SRCTIP)
Credit No.: 6673-NP…
Assignment Title: Consultancy Service for Detailed **Design of Upgradation of Kamala-Dhalkebar- Pathlaiya Section of Mahendra Highway and Bridges**
Reference No.: SRCTIP-DoR-KDP-CS-QCBS-02

The Government of Nepal has applied for financing from the World Bank toward the cost of Strategic Road Connectivity & Trade improvement project (SRCTIP) and intends to apply part of the proceeds for consulting services.

The consulting services ("the Services") include **conducting Detailed Survey and Design for Upgrading of the Kamala-Dhalkebar- Pathlaiya Section (130 Km) of the Mahendra Highway to 4-lane standards. The Consultant shall prepare Detailed Project Report of the Highway and associated Bridges**. Terms of Reference is available in the website of the Department of Roads: www.dor.gov.np/notice. Anticipated date for commencement of the services is January 2021 and the tentative duration of the assignment is about 13 months.

The Department of Roads, Development Cooperation Implementation Division (DCID) now invites eligible International Consulting firms ("Consultants') to indicate their interest in providing the Services. Interested Consultants should provide information demonstrating that they have the required qualifications and relevant experience to perform the Services. The short-listing criteria are:

- Core business and years in business (minimum 5 years)
- General experience of the Consulting firm in detailed survey and design of civil engineering projects
- Relevant experience of the Consulting Firm with similarity in nature, size, complexity (detailed design of Road and bridge projects)
- Technical, Managerial and organizational capability of the firm for the assignment

The attention of interested Consultants is drawn to paragraphs 3.16 - 3.17 of the World Bank's Procurement Regulations for IPF Borrowers*, dated July 2016*, revised August 2018 ("Procurement Regulations") setting forth the World Bank's policy on conflict of interest.

A consultant will be selected in accordance with the Quality & Cost Based Selection (QCBS) method set out in the World Bank's Procurement Regulations.

Consultant may associate with other firms in the form of a joint venture or a sub-consultancy to enhance their qualifications. Consultant shall clearly state the form of association, if any, whether in the form of joint venture or sub consultancy in the Expression.

Interested Consultant may obtain further information about the service at the address below during office hour.

Expression of interest must be delivered in written form during office hours to the address below (in person, or by mail, or by e-mail) by **25th June 2020**

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BRIEFING

Girl's suicide sparks protest over access to online classes

KOCHI: Students have protested in southern India after the suicide of a teenage girl who was unable to attend online classes because she did not have a television or smartphone. Schools have been shut across India since the country locked down its 1.3 billion people on March 25 to curb the spread of the coronavirus, leaving millions of children whose families cannot afford expensive devices with no access to education. Among them was Devika Balakrishnan, the 14-year-old daughter of a daily wage labourer in the southern state of Kerala who was found dead near the family home on Monday, the first day of the new school term, having apparently taken her own life.

Iranian professor jailed in United States returns home

DUBAI: An Iranian professor who was acquitted in the United States of stealing trade secrets arrived in Iran on Wednesday, Iranian media reported. Materials science professor Sirous Asgari, 59, was indicted by US federal prosecutors in April 2016. A federal judge in Ohio acquitted Asgari in November 2019. Tehran and Washington have denied reports that his release was part of a prisoner swap. US authorities said in May that Asgari, who tested positive for the novel coronavirus in April, would be deported once he received medical clearance. Photos published by Iranian state media showed Asgari being reunited with his family in Tehran on Wednesday. Last year, Iran freed US citizen Xiyue Wang, who had been held for three years on spying charges, and the United States released Iranian Massoud Soleimani, who faced charges of violating US sanctions on Iran.

Covid-19 death toll among nurses doubled in past month

GENEVA: More than 600 nurses worldwide are known to have died from Covid-19, which has infected an estimated 450,000 healthcare workers, the International Council of Nurses said on Wednesday. The death toll among nurses more than doubled in the past month from 260 on May 6, according to its figures, which are based on data from more than 30 countries. "In the last two months, we have seen the number of deaths of nurses as a result of coronavirus around the world rise from 100 to now in excess of 600 and we think worldwide the number of healthcare workers who could be infected by the virus is around 450,000," Howard Catton, chief executive officer of the Geneva-based ICN, told Reuters. (AGENCIES)

Brazil toll tops 30,000 as Italy reopens borders

Greece suspends Qatar flights after detecting infections on a flight from Doha to Athens.

AFP/RSS

Primary school children wearing face masks as a protective measure against the Covid-19 novel coronavirus undergo a temperature check as they arrive for class at Hasin Primary School in Sosong District in Pyongyang following the re-opening of schools on Wednesday.

AGENCE FRANCE-PRESSE
RIO DE JANEIRO, JUNE 3

Brazil surpassed 30,000 deaths from the coronavirus outbreak as the disease continued to rip through Latin America, while Italy—at one point the hardest-hit country—prepared to reopen its borders in time for the European summer.

After chalking up devastating human losses in Europe, the virus has now taken a firm grip in Latin America, where Brazil surpassed a chilling landmark late Tuesday.

The latest official Covid-19 death toll of 31,199 is the fourth-highest in the world, after the US, Britain and Italy.

The figures come as some Brazilian states began to emerge from weeks of economically-stifling quarantine measures despite warnings from the WHO and epidemiologists it is too much, too soon.

"In the current situation, relaxing the measures is adding gasoline to the fire," Rafael Galliez, an infectious diseases expert at the Federal University of Rio de Janeiro, told AFP.

Yet surfers and swimmers streamed back to the beach in Rio de Janeiro as the city started easing lockdown measures, allowing the reopening of places of worship and water sports.

"I think that here, in the water, there is no risk. It's not like in the stores," said Cesar Calmon as he delighted in the waves off Ipanema beach.

In Europe, most countries have flattened their initial infection curves and are gradually easing out of confinement as they try to curb the economic fallout of the shutdowns.

Italy reopens its borders to travellers from Europe Wednesday, three months after the country went into lockdown, with hopes for economic revival pinned on reigniting its tourism industry.

But there were fears many foreign tourists will be put off visiting a country where 33,000 people died of the disease.

"Come to Calabria. There's only one risk: that you'll get fat," the southern region's governor Jole Santelli said as the race began to lure big-spenders—or any spenders—back to Italy's sandy shores.

In a symbolic victory in the French capital, Parisians reclaimed beloved cafe terraces that were allowed to sprawl across pavements to accommodate social distancing measures.

"Coffee on a terrace, that's Paris!" said Martine Depagniat, among those enjoying the new freedom after 10 weeks of closures.

Schools, swimming pools, pubs and tourist sites are steadily reopening across the continent to ease the economic pain, and stock markets rose on European optimism, despite fears of a second wave of infections.

Greece suspended flights to and from Qatar on Tuesday after detecting multiple infections on a flight from Doha to Athens.

The respiratory disease has claimed nearly 400,000 lives and infected more than 6.2 million in its rampage around the globe, upending life for billions since it first emerged in China late last year.

The focus now falls on Latin America, which passed one million cases this week.

Brazil has more than half of that caseload—555,383—making it the second most affected country after the United States, where experts fear mass demonstrations over the police killing of African American George Floyd could reignite the spread of Covid-19.

The World Health Organization has warned that healthcare systems could soon be overwhelmed with Peru, Chile and Mexico also seeing big daily increases in infections.

Mexico has also started rebooting the economy after more than two months of shutdown, allowing activity in the car, mining and construction industries to resume.

In Venezuela the virus forced political rivals to come together, with the government of Nicolas Maduro striking a deal with opposition leader Juan Guaido, who claims the presidency, to seek resources to address the disease's spread, all parties confirmed Tuesday.

Meanwhile at least 20 journalists have died from the coronavirus outbreak in Peru, most of them infected while reporting on the pandemic, often with little protection, the country's journalists' union said.

Peru is Latin America's second worst-hit country after Brazil with more than 170,000 cases and 4,600 deaths.

"As of June 1, the number of dead colleagues is 20 in all of the country," said Zuliana Lainez of the National Association of Journalists.

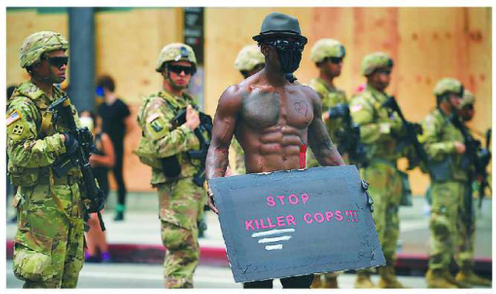
Many of them contracted the disease while reporting from streets, markets and hospitals on the effects of the virus, without proper protective equipment, Lainez said.

"They have gone to hospitals, which are foci of infection, with homemade masks," she said.

Back where it all began in Wuhan, the Chinese city where the virus first emerged in December, officials touted another success after finding only 300 positive cases after testing nearly 10 million people over the past two weeks.

"These numbers show that Wuhan is now the safest city," said Feng Zijian, deputy director of China's national Center for Disease Control and Prevention.

US protests defy curfews as Trump faces backlash for violent crackdown



AFP/RSS

A protester holds a placard in front of a row of Army National Guard during a demonstration over the death of George Floyd in Hollywood, California.

AGENCE FRANCE-PRESSE
WASHINGTON, JUNE 3

Protesters defied curfews across the United States as leaders scrambled to stem anger over police racism while President Donald Trump rejected criticism over his use of force to break up a peaceful rally.

Standoffs between police and demonstrators stretched into the night in cities from New York to Los Angeles over the death of George Floyd, an unarmed African-American man whose killing has brought once-in-a-generation protests to the nation for the past week.

But there were fewer reports of the looting and violence that had soured street demonstrations in previous nights. Tens of thousands gathered on Tuesday in Houston to pay a hometown tribute to Floyd, who grew up in the Texas city and is to be buried there next week.

In New York, which on Tuesday prolonged its first curfew since World War II for the full week, AFP reporters saw hundreds refusing to go home after the 8:00 pm cutoff, instead chanting slogans and peacefully walking the streets in Manhattan and Brooklyn.

Hours after the curfew, mayor Bill de Blasio said it was a "very calm situation," a day after several Manhattan luxury stores were looted.

Minnesota took one of the first concrete actions to address the grievances behind the uprising, which began after Floyd's death on May 25 in the state's largest city Minneapolis.

The state launched a civil rights investigation of the Minneapolis Police Department, looking at possible "systemic discriminatory practices" going back 10 years, Governor Tim Walz tweeted. Former president George W Bush called on the US to examine its "tragic failures" and to "listen to the voices of so many who are hurting and grieving."

And in Los Angeles, one of dozens of cities hit by unrest, police officers and Mayor Eric Garcetti dropped to their knees in a symbolic act of solidarity as they met marchers led by African-American Christian groups.

But protesters gathered outside Garcetti's residence late into the evening. An AFP reporter witnessed a group of at least 200 refusing to disperse and subsequently arrested.

In Washington DC, thousands returned to the streets Tuesday for a peaceful "Black Lives Matter" march.

Hours after the 7:00 pm curfew protesters could be heard chanting, as National Guard troops stood on the streets near the White House and helicopters hovered above.

Broadcast footage showed police firing tear gas shortly after midnight, but the situation appeared to be calm overall.

"I'm just tired, essentially, of being scared of police, of not getting justice," said Jada Wallace, an 18-year-old protester outside the White House earlier who said she was ready to risk arrest.

In the same place on Monday, federal police had abruptly opened tear gas and fired rubber bullets to break up a non-violent protest, clearing a path for Trump to stroll outside for a photo-op at a historic church damaged the previous night.

The move was loudly condemned by religious leaders, the president's political rivals, and onlookers around the country.

China warns Britain interfering in Hong Kong will 'backfire'

AGENCE FRANCE-PRESSE
BEIJING, JUNE 3

China warned Britain on Wednesday that interfering in Hong Kong will backfire, after the former colonial power vowed to give sanctuary to locals who may flee the city if a controversial security law is passed.

The United States and Britain have enraged Beijing with their criticism of planned national security legislation that critics fear would destroy the semi-autonomous city's limited freedoms.

British Foreign Secretary Dominic Raab has further angered Beijing by suggesting that it had time to "reconsider" the plan, which could soon be enacted after the proposal was endorsed by China's rubber-stamp parliament last week.

REUTERS

Carrie Lam

Prime Minister Boris Johnson, meanwhile, said London would not "walk away" from Hong Kongers worried by Beijing's control over the international business hub.

Johnson wrote in a column for The Times newspaper and the South China Morning Post that he would offer millions of Hong Kongers visas and a possible route to UK citizenship if China persists with its national security law. Chinese foreign ministry spokesman Zhao Lijian said Beijing had lodged "serious representations" with London over Raab's remarks, which "grossly interfered" in Hong Kong's affairs.

"We advise the UK to step back from the brink, abandon their Cold War mentality and colonial mindset, and recognise and respect the fact that Hong Kong has returned" to China, Zhao said at a regular briefing.

TERMS OF REFERENCE (TOR)

FOR

DETAILED DESIGN OF UPGRADATION OF KAMALA-DHALKEBAR- PATHLAIYA SECTION OF MAHENDRA HIGHWAY AND BRIDGES UNDER

STRATEGIC ROAD CONNECTIVITY & TRADE IMPROVEMENT PROJECT (SRCTIP)

1. Background

Kamala- Dhalkebar section (21 km) of Mahendra Highway was constructed in 1970's with the assistance of Government of India and the section from Dhalkebar to Pathlaiya (109 Kms) was constructed later with the assistance from then USSR. Later in 1990's both of these sections were upgraded to two lane standards. The existing bridges at Kamala- Dhalkebar section are of two lane standard while the bridges at Dhalkebar -Pathlaiya section are of intermediate lane (5.5 m width) standard and as a result the bridges are now bottlenecks to the traffic. The passenger and freight traffic have been increasing in this highway as a result of trade enhancement due to regional trade agreements such as BIMSTEC, SAFTA, BBIN etc. Further enhancement of trade among the member countries and increasing traffic volume requires an upgrade of this road section to Asian Highway Standards (Class I). Kamala- Kanchanpur section of this highway has been already taken up for upgradation to 4 lane standard under the ADB financing.

In order to enhance road capacity and efficiency in the road transport, Government of Nepal, Department of Roads (DoR) intends to upgrade the Kamala- Dhalkebar- Pathlaiya Section (KDP), 130 Kms of Mahendra Highway. A Feasibility study for upgradation of existing 2-lane to 4-lane standards (including road and bridges along this section) facilitating the safe, resilient, cost effective, environmentally-friendly and inclusive road transport infrastructure is completed by DoR, DCID in January 2020. Following the feasibility study results and recommendations, the DoR under the financing of Strategic Road Connectivity & Trade Improvement Project (SRCTIP) intends to hire consulting services for conducting a Detailed survey, investigations and design for the overall KDP section for upgradation of existing 2-lane to 4-lane standards (including road and bridges along this section) facilitating the safe, resilient, cost effective, environmentally-friendly and inclusive road transport infrastructure.

2. Objectives of the Assignment

The main objective of the consulting services (the Services) is to carry out the detailed engineering survey, investigations and design of roads and bridges for the upgradation of Kamala- Dhalkebar-Pathlaiya section of Mahendra Highway as shown in Table-1 below:

Table 1

Sn	Description	Length	Upgrading scope
1	Detailed Design of Upgradation of Kamala-Dhalkebar- Pathlaiya Section of Mahendra Highway and associated Bridges	130 km with 76 Bridges (Bridge details in Annex 1)	Upgrading of road from existing 2-lane to 4-lane standards and bridges

The main objectives of the consultancy services are to conduct:

i. Conduct detailed survey, investigations, and engineering design of Mahendra Highway (Kamala- Dhalkebar- Pathlaiya Section, 130 Kms) and 76 bridges incorporating road safety features and relevant environmental and social measures based on the ESMP,

ii. Use of innovative Design for the road pavement and the existing bridges along the Highway sections.

iii. Identification and detail design for the wild life crossing structures tentatively 8 places as defined in the feasibility study,

iv. Detail condition assessment of the existing bridges and design for remedial maintenance and rehabilitation measures,

v. Detailed Survey and Design of Intersections (Crossings/ Underpasses /foot over crossings and others) at Major Junctions and appropriate design for all the crossings/ junctions.

vi. Conduct alternative analysis of the alignments, design, construction techniques, etc. showing: 1) environmental and social, 2) resiliency and longevity, 3) constructability, 4) safety, 5) cost, and 6) other relevant risks and impacts for each alternative. This analysis would have to be done in close collaboration and in consultation with the separate consultants hired to undertake the social and environmental assessments and planning in accordance with the Bank ESF.

vii. Integrate relevant environmental and social measures and recommendations of road safety assessment and audit analysis, e.g., wildlife passes, safety features, etc. into the detained engineering designs and bid documents.

viii. On the basis of detailed design prepare the necessary standard/special, Specifications, Cost Estimates, Bill of Quantities, Contract packaging and preparation of Bid documents.

3. Scope of Services

3.1 General Scope of Services

The consultancy services will include but not necessarily be limited to the following:

i. Study the Feasibility report carried out for the Upgradation of the road for investigation and recommendations for the alignments including bridges and other road related structures in terms of socio-economic factors of the influence area, traffic, topography, geology, environmental and social aspects, soil and other related factors along the alignment with maps, sketches, wherever necessary for the detailed engineering survey, investigations and design. Where there remain planning or design decisions necessary to complete the detailed design (for example, road alignment/ layout, access control, bridge width, etc.) complete any additional analyses necessary to inform such decisions.

ii. Carry out engineering surveys and investigations, including topographic surveys, as required to prepare detailed engineering designs, drawings as appropriate to prepare bills of quantities within reasonable accuracy

iii. The Consultant shall conduct the necessary environmental and social assessment with due consultations with relevant stakeholders and with separate ESIA consultants, during the design processes, and identify sensitive areas and features such as wildlife corridors, cultural heritages, natural habitats and/or critical habitats etc. as well as screen for potential direct, indirect and induced impacts, and mitigation measures including cost.

iv. The Consultant will coordinate, interact and share information on design and assessment on environment and social aspects with the ESIA consultant. Integration of environmental and social findings and recommendations from the ESIA consultants in the technical design, cost estimate and bid documents is very important. For better coordination the Consultant, besides regular meetings and sharing of data / information, shall be needed to organize workshops, consultation/ dialogues with stakeholders, joint working sessions with ESIA team. etc).

v. Prepare detail design and drawings for the road pavement sections, retaining structures, slope protection measures, drains, cross drainages structures, bridges and intersections, flyovers, noise walls, and all other items necessary for construction of a safe, efficient, and resilient road; applying sound engineering practices and integrating environmental and

social measures in accordance with the ESIA/ESMP prepared separately and the WB's ESF 2017 and Government's related regulations and policies.

vi. Conduct detailed geotechnical investigations along the road to investigate the suitability of local construction materials and, where necessary, locate the potential quarries and borrow pits and assess the quality and quantity of materials and hauling distance.

vii. Conduct detailed geotechnical field investigations, materials lab analyses, provide boring logs, and prepare geotechnical design recommendations as necessary to facilitate the resilient design of bridges and other structures.

viii. Study the hydrological regime in detail, based on the catchment area, an analysis of rainfall and flood records, supplemented by engineering field investigations, to establish the adequacy of road embankment levels, culverts, and side ditches, and design bed and slope protection for the drainage structures and bridges.

ix. Assess existing features in the periphery of existing road such as barrow pits, ponds and possible additional other features such as recharge ponds/pits/wells that could be implemented to achieve water harvesting and to improve the road's resilience.

x. Assess possible use of water from roads for productive use in safe manner plus recharge and necessary structures like culverts for it in consultation with local people, especially where roads pass through agriculture areas.

xi. Assess cross-drainage requirements and propose new structures (bridges, culverts, and causeways as appropriate) or improvements to structurally unsound structures, if any.

xii. Prepare practical and cost-effective geometric (horizontal, vertical, intersection, etc.) designs and pavement structural designs on the basis of projected traffic levels; pavement structure studies; axle-load considerations, considering previous studies; traffic safety; environmental and social impact assessment; biodiversity management plan and other relevant inputs

xiii. Determine the most cost-effective improvement option for the proposed road section. Prepare a pavement preservation schedule using the latest technology in pavement management to forecast future maintenance needs that presents the most cost-effective overlay, crack sealing, and other treatments at the right times, in order to extend the life of the pavement for as long as possible in a cost-effective manner.

xiv. Prepare standard and special engineering technical specifications for each work item, taking into account relevant specifications and best practices in use in the country and internationally for similar works and relevant environmental and social measures based on the ESIA/ESMP and related plans.

xv. Hydrographic survey, utility survey, identification of Underground Structures and Other Obstacles, Structure Preconstruction Survey shall be carried out throughout proposed alignment.

xvi. Conduct road safety audit and assessment analysis and incorporate the findings and recommendations into the detailed designs. The design consultants will be expected to use state of art technology in managing the road safety in design for road and bridges. The Consultant shall also make assessment and make provisions for managing road safety aspects and traffic management during construction including work-zone safety protocols, that to be included in the bidding documents.

xvii. Prepare detailed engineering designs of road, pavement, bridges and structures, and bills of quantities, and calculate engineering and environmental and social management costs estimates for civil works broken down into foreign and local components.

xviii. Prepare drone survey video of current status of road section and bridges throughout so that it could be compared to the status after project implementation. And also prepare short animated video of road, bridges and intersections presenting the details of designs, features,

concepts, traffic flow etc., with voice over and music. Prepare design visualization still images and videos of proposed roadway and bridges.

xix. Prepare design and drawings for major intersections with safety features.

xx. Integrate, as appropriate, environmental and social measures to avoid/ minimize / mitigate and offset adverse impacts into the detailed plans and designs and are fully costed and included in Bidding Documents and BOQs, etc.

xxi. Prepare contract packages, taking into account the location of the project roads and specific Project Procurement strategy for Development (PPSD).

xxii. Prepare a practical and resource based project schedule considering each contract package with detailed analysis and graphical representation showing critical construction activities and floats using CPM/PERT which shall justify the project duration of each contract package. The schedules will reflect seasonal climatic effects at the work sites and take into account typical outputs based on similar earlier road projects.

xxiii. Once the generic bid documents are discussed and finalized the Consultant shall prepare and submit bidding documents for each contract packages in soft copy and hard copy (5 sets). Conduct capacity development activities through regular interaction activities with the client team for the purpose of discussions and knowledge transfer on latest technologies, applied procedure, methods etc. on road/ bridge design & construction and current international practice on contract administration, contract management, disputes and its resolution etc.

Detail Survey, Investigations, and Design of Upgradation works in Roads and Bridges in Kamala-Dhalkebar- Pathlaiya Section, Mahendra Highway

3.1.1 Detail Survey, Investigations, and Design of Kamala- Dhalkebar- Pathlaiya Section, Mahendra Highway

Detailed Survey, Investigations, and Design of Road shall be based on the recommendations of the Feasibility report and the best alternative as agreed with DOR. The road design should accommodate the future generated traffic volume of at least 20 years considering it as a major highway in Nepal that joins East to West and trade routes linking Indian borders at South towards North. The required measures to address the concerns of environmental, social and road safety are to be incorporated in design. The Environmental and social assessment and management planning process including development of Environmental Management Plan, Social Action Plan, Resettlement Action Plan, Vulnerable Communities Development Plan and any others as required under World Bank ESF policies and/or national legislation for the Upgradation works will be carried out in parallel under a separate, independent consultant, as required under World Bank safeguard policies. However, the Consultant is expected to collaborate, share information and coordinate with the Environmental and Social Assessment (ESA) Consultants to ensure that the specific findings, analysis of alternatives and recommendations of these studies are fully integrated into the detailed design and fully costed and included in bid documents and BOQs, etc. The close collaboration will also ensure that the environmental and social plans are adequately addressing as per the proposed detailed design.

In addition to the General scope of services the design shall also cover the Special features as listed below:

a) The Consultant shall prepare the Detailed Engineering Design for execution of the upgradation of road works which shall include upgradation of road geometrics, side drains, drainage structures, retaining and protection structures, slope stabilization and bioengineering works, road pavement works and miscellaneous ancillary works, such as toll facilities, pedestrian overpasses/underpasses, road safety features, special structures such as underpasses/overpasses to facilitate wildlife movement, and other relevant design measures for a wildlife friendly road (informed by ESIA), etc.

b) Design should refer the Nepal Road Standard 2070 (2013), Pavement Guidelines, Bridge Design Standard and other relevant standards of Department of Roads, International Standards and Practices and engineering analysis and judgement.

c) All the design works shall be substantiated by design calculations and verified by international best practices especially for pavement thickness, retaining walls, cross drains, size and type of drains, capping layers for wet area and poor sub-grade strata

d) Design shall consider the intersections at major junctions at areas like Pathlaiya, Nijgadh, Chandranigahpur, Bagmati, Karmaiya, Sagarnath, Nawalpur, Lalbandi, Bardibas, Dhalkebar, Dharapani, Kamala, and other locations as necessary to maintain a Level of Service (LOS) B at the design speed of 100 kmph, referring to relevant International Standards and Practices.

e) Design shall consider the provision of controlled access lanes at market areas and multiple lanes shall be separated by standard median throughout with greenery plans. Designs should consider the physical treatments for speed reductions in the urban areas of the corridor.

f) Design shall consider the provision of separated footpaths, railings and pedestrian crossings (taking into account stakeholder feedback through the road safety consultation process) at market areas considering the concept of "universal access" and equality to all road users

g) Design should consider providing holding lanes, entry lanes and exit lanes at suitable locations as per the suggestions of the stakeholders consultation during ESIA study and recommendation of feasibility study referring to the relevant International Standards and Practices

h) The road alignment should be properly designed harmonizing to the highway standards accordingly.

i) The Consultant shall design suitable Bus bays/stops, Toll stations, Truck lay byes, weighing stations, parking areas, rest areas, pedestrian crossings, wildlife crossings, noise barrier walls, and other ancillary items and prepare suitable separate designs. Rigid Pavement or any other appropriate pavement should be considered at the bus-bays/ parking lots. The bus stops/stations shall be spacious, with shades, chairs, friendly to differently abled people, accommodating several components like Digital Information boards, Digital maps and information, Restrooms (gender friendly), cabin for Security personnel etc.

j) All the design works must follow the requirement and standard acceptable to DoR and should be based on current proven and accepted national and international practices.

k) Designs should fully reflect and integrate findings of the Environmental and Social Assessment and Planning studies being carried out under separate but parallel consultant team.

l) The Consultant shall prepare the design drawings with sufficient detail for bidding purpose and also for execution of the construction works in appropriate size, scale and format acceptable to DoR.

m) The consultant shall use the data collected during the hydrological survey and determine the type of the cross-drainage structure and its capacity, road side drainage and subsurface drainage. Existing drainage structures should be used wherever possible.

n) Review present practices followed in the highways on road safety issue and recommend site specific upgradations, where necessary.

o) Identify road location stretches requiring Upgradation works for road safety and prepare appropriate and cost-effective designs.

p) Identify the requirement of safety measures along the bridges prepare the appropriate cost-effective designs

q) Road Safety measures to be incorporated in the design based on international Research outcomes and Road safety audit or assessment Report. Incorporate the international best practices on road safety treatments with a particular focus on safety treatments for (a) head on crashes, (b) run off the road crashes, considering both the day time and night traffic.

r) Identify the requirement of safety Crash Barriers along the vulnerable sections and other safety measures as necessary (concrete or cement masonry confidence blocks) including cats eyes and reflective paints at permanent structures.

s) Identify the stretches, places and prepare appropriate plans for conducting awareness program for drivers, public, and children on road safety (taking into account stakeholder feedback through the consultation process).

t) Identify the road signs and other features to improve visibility and influence driver behavior, according to international standards including amendment in DoR standards for road signs, if necessary

u) Identify the requirement of safety measures along the bridges and proper recommendation for the design and Upgradation in existing bridges.

v) Evaluate construction-related traffic management and road safety issues, and propose a plan to address road safety concerns during the construction/upgrading phase of recommended Upgradation works for road segments and bridges.

w) Prepare appropriate and cost-effective designs, cost estimates, specifications.

x) Prepare a detailed prioritized activity plan for each road section to address the road safety issues identified/ encountered during the safety audit, which may include structural/design recommendations, awareness raising and educational campaigns, emergency response plans and measures, institutional aspects / institutional strengthening measures to conduct monitoring and enforcement, provide emergency response in case of accidents, etc. (taking into account stakeholder feedback as appropriate through the consultation process).

y) Prepare a plan for effective post-crash response mechanism development considering both humanitarian and physical aspects.

z) Before finalizing the design drawings, the Consultant's team needs to agree the procedure with DoR and verify the survey details and the design drawings with proper verification in the field by checking the alignment.

aa) Final design and drawings shall be prepared and submitted only after field verification and approval from DoR. The final design and drawings as well as other documents incorporate site-specific environmental mitigation measures.

bb) The Consultant shall furnish the important documents, reports, drawings and other necessary information in the DoR acceptable format in soft copies compatible with DoR's Management Information System. At a minimum, all deliverables shall be furnished in both the original document format (for example, MS Word, Excel, AutoCAD, etc.), PDF format, and hard copies.

3.1.2 Detail Design of Bridges along Mahendra Highway (Kamala-Dhalkebar- Pathlaiya Section)

In the same manner as for the road sections, the detailed design of bridges will also require close collaboration with the separately contracted Environmental and Social Assessment Consultants to ensure that the specific findings and recommendations of the ESIA, Environmental and Social Management Plan, Biodiversity Management Plan, Resettlement Action Plan, Vulnerable Communities Development Plan, and any other environmental and social plans required as per WB ESF (2017) are fully integrated into the detailed design process, and are fully costed and included in bid documents and

BOQs, etc. The close collaboration will also ensure that the environmental and social plans are adequately informed by detailed design decisions related to the bridges.

The location of new bridges shall be chosen so as to eliminate the need to close the Mahendra Highway for any length of time, harmonize with the highway geometric standards, and ensuring the safety of the existing bridge.

The design of bridges should be carried out to enhance the capacity of bridges and other cross drainage structures to match the upgradation works to enhance the road capacity and road safety, with consideration for additional future widening, where cost effective.

There are 76 major bridges on this KDP Section. The existing 64 out of 76 Bridges have the least 5.5 m carriage width and the other 8 bridges have a carriageway width of 7 m and remaining 4 bridges have varying carriageway widths of 6.8 m, 7.5m, 8 m etc. The table in the Annex 1 lists out the various features of bridges on this KDP section.

All bridges along the road section will be considered for new construction works. The design of the new bridges must be compatible with the proposed design relative to the upgradation works of the adjacent road section considering the geometry, geotechnical, road safety and road congestion studies. The Consultant should propose innovative ideas considering national context and the latest technology.

The design should be safe, reliable, wildlife-friendly, and cost effective with maximum use of appropriate technology minimizing any environmental and social risks and impacts associated with new bridge construction and/or bridge dismantling. The type, feature and condition of existing bridges should be given due consideration while designing any alternatives. The design shall, at a minimum, consider the following factors:

- Suitably matching to the upgraded road alignment.
- Type, size, lane width and span of the proposed bridge.
- Present condition of each component and general features of the existing bridge.
- Load carrying capacity of the existing bridges.
- Theoretical structural analysis of the existing bridges and its make.
- Topography, locations, environmental sensitive areas such as wildlife corridors and surrounding land uses at bridge site.
- Nature and structure of the soil underneath
- Other structures in proximity to each bridge
- Aesthetics of the surrounding area
- Availability of space for traffic diversion for traffic management during construction
- Road safety measures to be introduced after provision of proposed bridge
- Constructability
- Time to construct
- Use of Precast superstructure construction technology
- River training and other protection works required
- Social and environmental issues and mitigation measures as identified in the ESIA/ ESMP and related plans such as the biodiversity management plan
- Road users and pedestrians' expectations
- Other information as needed

Alternative design options should be presented, discussed, and the best option to be finalized based on the consultation and discussion with the DoR. The final report should document the process of identification and assessment/ranking of all alternatives considered related to bridges and justifying the proposed best alternative.

3.2 Detailed Survey, Investigations, and Design of Road, Bridge and Other Structures

3.2.1 Details of surveys and studies

3.2.1.1 Topographical survey and mapping

The topographical survey shall collect adequate data to show the following details in the subsequent topographical map:

a. Topography with details such as: trees & forest, water bodies, wildlife habitat and movement corridors, sacred/ cultural & religious sites (including natural features with cultural values, e.g. trees, cliffs, etc), existing infrastructures and other land features

b. Existing road details such as: formation width, paved area, access roads, bus bays, footpath, parking places, traffic signs, islands, signals and right of way (RoW) limits (Buildings, Taharas, shops etc.)

c. Details of existing cross-drainage structure details such as: length, width and heights of culverts, bridges, details about bridge spans, pier, abutment, railing and vertical clearances, existing access under the bridge, river training works and river bank structure details

d. Existing power line alignments and elevations (if buried) such as: high-tension poles, low-tension poles, transformers, sub stations, Streetlights poles, underground electrical supply (if any) etc.

e. Existing telecommunication alignments and elevations (if buried) such as: telephone lines, poles, cabinets, towers and underground lines (if any)

f. Existing water supply line details such as: supply mains, distribution lines, valves, valve chambers, underground water storage, fire hydrants, etc.

g. Existing sewer line details such as: trunk sewers, branches, manholes, location/position of septic tank and soak pit of the adjacent building on the both sides of road within the RoW

h. Existing buildings and structures details such as: religious shrines, tangible cultural heritage, community building governmental building, and residential building, type of foundation and tentative depth of foundation of the building

i. Existing or potential flood prone zones/ spots, low laying areas and river-bank cutting areas

j. Survey and Production of a map of a minimum 100 m wide road corridor in 1:1000 scale and with 0.20m contour interval and clearly showing the center-line of existing roads and all features. The consultant may consider and propose wider bandwidth or additional survey areas if necessary for design.

While conducting Survey works, the survey team should be accompanied by a highway engineer. The Consultant shall acquire the reference coordinate points from the Department of Surveys and referencing of all the survey works shall be made on these references. It should establish benchmarks at a distance of every 500m along the road and on the both sides of the riverbanks in case of bridges.

While conducting the topographical survey for bridge design, the survey area should cover a minimum distance of 500m upstream, 200m downstream and 200m from the river banks on either side of the river at the proposed bridge site or more if necessary for analysis and design. In case of the topographical survey of the bridge site, the topographic map should show the following:

I. Contours at 0.2 m intervals;

II. Flood lines on either side of the river in the entire area surveyed;

III. Both banks of the river;

IV. River cross section at 25 m intervals, or less if required for modeling, analysis, and/or design; one cross section along the proposed bridge axis showing cross profile of 1m interval using suitable method;

V. Details of government and/or public establishments on the river banks, details of existing river training works (if any);

VI. Traverse lines, benchmarks reference lines and/or points with respect to which the present topo map is prepared;

VII. The angle and direction of skew, if the bridge is proposed to be aligned skew;

VIII. The foundation type and zone of influence of the existing foundation of the bridge or any other structures adjacent to the proposed bridge site;

IX. Other information relevant to design, construction and/or maintenance of the bridge;

3.2.1.2 Hydrological survey

For determination of all design data the consultant shall carry out a detailed hydrological survey and study of the river and bridge sites, which shall include the following:

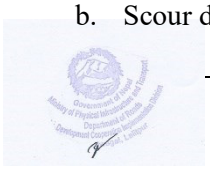
a. Catchment area of the river up to bridge site;
b. Nature, size and quantities of debris carried by the river;
c. Intensity, duration and distribution of rain in the catchment;
d. Existing bridge or other hydraulic structures across the river in the vicinity of the proposed bridge site with their details as much as possible;
e. General slope of the river from the critical point (origin) of the river up to bridge site and general slope of the catchment in both sides of the river;
f. Cross sections covering 100m on either side. Beyond flood lines of the river at proposed bridge site, at about 500m. u/s and about 200m d/s. wherein HFL, LWL, LBL, area of the cross section, wetted perimeter and geological profile with silt factor of each strata (at proposed bridge site only) shall be indicated. (Horizontal and vertical scale of the cross section shall be the same.);
g. Bed slope of the river which must start from 100m up of the U/S cross section and end at 100 m. down of the d/s. cross section;
h. Maximum discharge calculated by established formulas with different return periods and the peak discharge observed over a period of 100 years;
i. Velocity and depth of flow at the time of survey;
j. Shifting of the river in the past at proposed bridge site and in its vicinity;
k. River-bed degradation or aggradation (covering 500 m upstream and 500 m downstream);
l. Use of river as migration corridor of wildlife and fisheries;
m. Other information required for river control, design, construction and maintenance of the bridge;

The hydrological survey shall collect secondary data, preferably from the governmental sources, to determine the following:

a. Unit hydrograph for the catchment of River for bridge construction
b. Size of the opening and location of cross drainage structure
c. Minimize modification to the natural drainage pattern

After the selection of the proposed bridge site with alternatives and preparation of topographic maps, the Consultant shall discuss the collected hydrological and other data and decide the following points with the client for final decision of the bridge site:

a. Design discharge
b. Scour depth, Maximum Scour depth



c. Linear waterway needed to be provided

d. Anticipated soil condition for foundation

e. The most feasible proposed bridge site

f. River- training & approach roads

g. Type of proposed foundation, substructure and superstructure

The Consultant shall also carry out a detailed hydrological survey and study along the road alignments and identify catchment, discharge in drain, cross drainage, seepage area etc.

3.2.1.3 Geotechnical Survey

For the pavement design, structures and buildings, the following geotechnical tests should be performed as per site requirement:

a. Determine the sub-soil condition through pitting (1m x 1m x1m) and Dynamic Cone Penetration (DCP) tests at 2 locations each 100m of the road alignment.

b. Determine the sub-soil condition through 2m deep pitting and DCP test at each 25 m where a retaining wall of height more than 3 m is required.

c. Determine the stability of the cut slopes using appropriate stability analysis or through study, field surveys and investigation of materials at site.

d. Conduct other tests as required by the geological, geotechnical survey and study.

e. Benkelman Beam test for existing pavement evaluation (if necessary).

For the design of the bridges, the Consultant should conduct sub surface exploration. The subsurface exploration shall include the following:

a. Test pits and auguring

Test pits and auger-holes in the riverbed to a depth as required by the site condition or scouring criteria of the river shall be made and the required samples shall be taken for lab testing.

b. Bore-holes, field tests and laboratory tests

The properties of the underlying soil are determined by field and laboratory tests of the soil samples obtained from the boreholes drilled to a depth as mentioned in the next paragraph. As far as possible, the locations of the boreholes shall be under each abutment and piers. Generally, the tests listed in Table 2 are conducted for determination of soil properties:

Table 2: Type of tests and sampling frequency

SN	Type of Tests	Sampling Frequency
1	Undisturbed Soil Sampling	at least 2 at each borehole
2	Standard Penetration Test	as required but the interval not less than 1.5 m
3	Grain size analysis	at least 2 at each borehole
4	Hydrometer analysis	at least 2 at each borehole
5	Moisture content	at least 2 at each borehole
6	Bulk and dry density	at least 2 at each borehole
7	Unconfined compression test	at least 2 at each borehole
8	Consolidation test	at least 2 at each borehole
9	Direct shear test	at least 2 at each borehole

c. Depth of soil exploration

The depth of soil exploration from ground level shall be as follows (Table 3):

Table 3: Tentative depths of soil exploration

SN	Type of soil	Governing depth
1	Silty, sandy, clayey soil	3 times the design scour depth, or 1.5 times the least dimension of the foundation footing, or 25 m, whichever is maximum
2	Granular soil (gravels, boulders	dimension of the foundation footing, or 20 m, whichever is maximum
3	Rocks (soft or hard)	Not exceeding 8 m and minimum 5 m

The above-mentioned depths are indicative. The Consultant shall decide the actual required depth of soil investigation according to the field condition and design parameters. If rock is found at the beginning or at mid-depth, then the drilling works shall not exceed the depth as mentioned in the table above.

d. Changes in soil strata

During the boring, if there is any change of soil strata, the number of sampling of soils for different tests will be increased and the Consultant shall carry out the entire test required for each layer of soil. No additional payments will be made for such tests.

e. Soil exploration works to be certified

The client, if required, may ask the Consultant to submit the soil/rock samples obtained from the drilling works in core boxes and/or a bore-log certified by the concerned personnel at site. The Consultants shall take site photographs, video or other documentation as appropriate for all site investigation, surveys and studies.

3.2.1.4 Seismological Study

The consultants shall collect and refer to the available data regarding the seismic records of the area. The consultant shall conduct seismic vulnerability analysis of all structures and incorporate the findings in the design. While considering seismic forces on the bridge design, the Indian Standard Criteria for Earthquake Resistant Design of Structures, IRC: 6 along with other international codes may be followed.

3.2.1.5 Material Availability Survey

The Consultant shall conduct the material availability survey and study. It shall determine the quality and quantity of the materials required for construction. The availability of the necessary material shall be surveyed to determine the following:

a. Suitable quarry site for boulder, sub-base/base/pavement aggregates, concrete aggregates, sand, fill materials
b. Material to be transported from elsewhere
c. Material to be imported from outside Nepal, their source and route of transport
d. Source of water for construction, location of boring if ground water to be used

The Consultant shall conduct study on the availability of construction materials like, sand gravel boulders, timber, etc. with their engineering properties, quantities and lead up to the road works site

and bridge site. Quarry site of materials with their available quantities should be shown on a sketch plan with reference to bridge /road construction site.

3.2.1.6 Traffic Study and Analysis, Axle Load Survey

For the design purpose the traffic study at the critical points and intersection shall be made. Conduct traffic counts in strategic locations (e.g. adjacent to major junctions) along the KDP Section, validate these counts against DoR data and the limited count data presented in the feasibility study report, adjust the forecast analysis from the feasibility study as appropriate, and update feasibility study recommendations, as appropriate. The Consultant shall make traffic demand estimates and establish possible traffic growth rates in respect of all categories of vehicles, taking into account the past trends, annual population and real per capita growth rate, elasticity of transport demand in relation to income, estimated annual production increase. socio-economic development plans and the land use patterns of the region having impact on the traffic growth, the projections of vehicle, manufacturing industry in the country, development plans for the other modes of transport, commodity movement behavior should also be taken into account while working out the traffic demand estimates, and other factors as appropriate. Consider peak hour volumes, peak hour factors, seasonal adjustment factors, passenger vehicle equivalent conversions, and other adjustments as appropriate to recommend widening scenarios. Refine and add to the list of widening options presented in the feasibility study report, prepare a decision matrix for all options, and provide support to the DoR in making a widening decision.

Axle load surveys in both directions shall be carried out at suitable location(s) in the project road stretch on a random sample basis and deduce the result.

While selecting the location(s) of axle load survey station(s), the locations of existing bridges with load restrictions, if any, should be taken into account and such sites should be avoided.

The Consultant shall ascertain from local enquiries about the exceptional live loads that have used the highway in the past in order to assess the suitability of existing bridges to carry such loads.

Conduct turn movement volume counts at all major junctions and selected minor junctions with substantial traffic volume, as appropriate to inform design options and to incorporate into design. Junction survey information shall be collected and thoroughly analyzed prior to starting work on the preliminary and detailed design. This is necessary to adequately inform access control decisions, which need to be made prior to the start of detailed design in order to avoid rework and design schedule delays.

In-person surveys, community engagement, and coordination with E&S consultant and others as appropriate to propose pedestrian crossing and other ancillary feature locations.

Based upon the above-mentioned studies and investigations the consultants shall make the best use of their technical know-how and professional skill to arrive at conclusion and recommend the most cost-effective design parameters. The consultant shall discuss in detail all possible options and shall recommend the most appropriate option.

3.2.1.7 Condition Surveys for Bridges, Culverts and Structures

The Consultants shall thoroughly inspect the existing Bridges, Culverts and Structures and shall prepare a report about their condition including all the parameters in the approved format. The condition and structural assessment survey of the bridges / culverts / structures shall be carried out by senior experts of the Consultants for the bridges identified to be in a distressed condition based upon the visual condition survey, supplementary testing. Selection of tests may be made based on the specific requirement of the structure.

3.2.1.8 Inventory survey of Road and Road Side structures

The Consultants shall thoroughly survey existing alignment of Roads and prepare a detailed inventory report. The consultant shall prepare detailed drawings of the existing alignments showing plan, profile, drainage, structures, cross-section, roadside barriers, and other details.

3.2.1.9 Miscellaneous Studies/Investigations

If not covered by aforesaid, the Consultants shall perform other studies, explorations, tests surveys, calculations, etc. required to produce full and complete set of working drawings, specifications, bills of quantities, requirement of materials and complete cost estimates for the bridge/s including related works based upon which construction activities can be started to complete without further study and/or reference to them

3.2.2 Details of design works

3.2.2.1 Design of Road

Design of Road shall include the following:

a. Design of the vertical and horizontal alignment for a design speeds appropriate as per NRS 2070 and subsequent revision if any.

b. Design of highway cross-section. Drawings shall include proposed vs. existing cross sections every 10m.

c. Design of cut and fill slopes.

d. Structural design of retaining structures (Gabion, Masonry, Plum concrete, etc).

e. Structural design of all RCC structures (including of bridges, grade separated interchanges and underpasses).

f. Slope protection and Bio-engineering and green road.

g. Service lanes along settlement areas and bus bays.

h. Identification and design of road crossings for pedestrians and Vehicles from one side of road to another side.

i. Identification and design of wildlife passes/crossings.

j. Identification of road side service area and its design.

k. Production of design drawings (A3 size or appropriate) showing plan in 1:1000 scale, Longitudinal profile in 1000H to 200 or 100Vscale, cross-sections at 10 m interval in 1:200 or 1:100 scale

Road alignment designed on Digital Terrain Model (DTM) shall be set out at the site with staking the central line and taking levels with verification of design. The consultant may use internationally recognized software for the road and bridge design. However, availing the software for the design purpose and any errors arising thereof during construction shall be the responsibility of the Consultant. All the coordinates in the drawings shall be in reference to the coordinate value acquired from Department of Survey.

3.2.2.2 Design of Pavement

While designing the pavements, the Consultant shall:

a. Maximize the use of existing pavement layers (scrapping only in case of strength deficiency)

b. Design axle load as per NRS 2070.

c. Design shall consider the AADT data which needs to be collected by the consultant at the particular junctions/road sections, direct traffic counting at critical junctions.

d. Design of pavement on the bridges and approach roads.

The pavement design task shall also cover working out the maintenance and strengthening requirements and periodicity and timing of such treatments.

3.2.2.3 Design of Drainage Structures

While designing the drainage structures, the Consultant shall use the data collected during the hydrological survey and determine the following:

a. Type of surface and sub-surface drain;

b. Type of the cross-drainage structure;

c. Structural design of slab and box culverts;

d. Size and location of road-side drainage and cross drainage structures (appropriate side drains and cross drainages such as pipe culverts);

e. Design of the water conduit/rain water inlets/manholes to take storm water safely to the nearby natural stream;

f. Maximize the use of the existing structures.

3.2.2.4 Design of Bridges

1. Based on the collected information and results of the discussions mentioned above the consultants shall design the bridges following the standard codes of practice, norms and guidelines. In addition, the designer shall take into considerations of general aesthetics and architectural perspectives of the bridges to be designed. In respect of span arrangement and type of bridge at least three different alternatives (functionally and structurally) with cost benefit analysis considering environmental and social aspects shall be submitted to the client with recommendation of best alternate for each and every bridge.

2. The consultant shall do a thorough condition survey of existing Bridges and estimate the remaining life of the bridges. The consultant shall also study the possibility of construction of one 4 lane bridge, one/two double lane bridges on either side of the existing bridges, with detailed cost benefit analysis and present a report to client for approval.
In case of major Bridges with length more than 300m, the consultant shall design long span landmark bridge (suspension, cable stayed, network arch bridge etc.) or shall design Signature Bridge as appropriate in consultation with client.

3. The Consultant shall prepare General Arrangement Drawing (GAD) and Alignment Plan showing the salient features of the bridges and structures proposed to be constructed / reconstructed along the road sections covered under the Study. The width of bridges shall be double lane or 4 lane (depending upon the width of the road) with footpath. The Consultants shall also carry out the design and make suitable recommendations for protection works for Bridges as well as river training works. The design of bridge shall also include design of approach road with proper geometric design to connect with existing road alignment including road safety provision.

4. Utilize hydraulic modeling software (e.g. HEC-RAS, various 2D modeling solutions) to inform design and to analyze scour potential at and near bridge substructure units (for example abutments, piers, and bents) given climate risks and include climate resilient scour mitigation measures in design. Develop a cohesive strategy for the movement or restriction of movement of water underneath the roadway embankment, in accordance with DOR standards and international best practices, and incorporate into design.

5. The Consultant shall produce detailed quantity estimate of the bridge and its accessories. They shall collect information on sources of materials and their lead distances and prepare rate schedules and cost estimates based on the standard norms and prevailing district rates.

6. All activities related to field studies, design and documentation shall be done as per the latest guidelines, standard codes of practice (Nepal Bridge Standards) and norms. The Consultants

shall work in close coordination with the Bridge Branch of Department of Roads in every step of design of bridges

The design consultant is required to liaise and cooperate in a proactive manner with the checking officers of DoR Bridge Branch and Bridge Design Checking Expert, supplying design information for checking in accordance with an agreed schedule. The checking engineers will be required to provide check certificates as a key deliverable. It is the design consultant's responsibility to resolve all technical issues raised by the checking expert and DoR relating to the design in order to get the approval from DoR.

3.2.2.5 Design of Major Intersections

The Consultants shall conduct all traffic volume surveys, origin-destination surveys, and other surveys as necessary to inform the design of Major Intersections. The Consultants shall utilize one or more state of the art traffic modeling software packages (such as VISSIM, Synchro, SimTraffic, or others) to model the existing condition and proposed options using the traffic volumes and turn movements forecasted at different points in time. Prepare and present short traffic simulation videos depicting options for each junction to the DOR.

3.2.2.6 Road Safety Audit, Traffic Safety Features, Road Furniture and Road Markings

The Consultants shall conduct a complete road safety audit and analysis, and design suitable traffic safety features and road furniture including traffic signals, signs, markings, overhead sign boards, crash barriers, delineators etc. The locations of these features shall be given in the reports and also shown in the drawings. The road safety audit shall consider forecasted crash numbers and severities, the cumulative economic costs of crashes without mitigation, and the costs and benefits of mitigations measures.

All roadside signs and other furniture placed or retained within the proposed roadway clear zone shall be crashworthy or protected by roadside barrier.

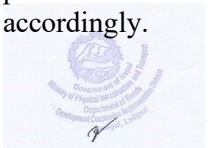
Ensure that all auxiliary lanes (including turn lanes, ramp acceleration / deceleration lanes, and others) have adequate deceleration/acceleration length, storage length, and taper length in the design year to mitigate the risks of rear end collisions and traffic delays.

Based on proposed site conditions, the Consultant shall conduct a thorough roadside barrier warranting process considering whether the hazard is within the clear zone, hazard severity, roadway geometrics, and an economic analysis.

The Consultant shall i) conduct a systematic and thorough safety analysis presenting existing deficiencies, ii) set road safety performance improvement goals for the designer to include during detailed design, iii) collect, analyze, forecast and consider vehicle crash/fatality history in developing the list of road safety mitigations.

3.2.2.7 Climate Resilient Design

Given extreme climate and weather uncertainties in Nepal, the consultant shall consider climate and weather resilience in all aspects of design, and especially in bridge and drainage design. At a minimum, consider: i) scour protection at all substructure units and streambanks adjacent to abutments beyond that which is normally required by standard, ii) river training works, iii) additional freeboard to account for hydrologic and design flow uncertainty due to catchment area conditions and climate change, iv) design bridges, culverts, and approaches to withstand overtopping, v) ensuring that all drainage structures are designed to be self-cleaning to the extent possible, and vi) oversizing large culverts to provide an additional factor of safety. Please add these or similar recommendations to report accordingly.



3.3 Procurement Assistance

Procurement shall be carried out in accordance with WB's Procurement Procedure. The Consultant shall prepare bidding documents, necessary standard/special specifications, contract packaging and any other appropriate assistance. Multiple civil works bid packages are anticipated.

3.4 Capacity Development

The consulting services shall include organizing in house, national training for capacity development of DoR personnel in different disciplines.

The consultant shall propose the capacity development component in their technical proposal and include the cost in their financial proposal. At a minimum, at least 5 capacity development workshops are required and up to 10 are possible if warranted.

4. Team Composition and Qualification Requirements for Key Experts

The consulting services shall be carried out by an international firm. Firm must have sufficient qualification and experience to carry out the assignment. As a minimum, the consultant (firm) must have (i) 5 years of standing in consulting services in the road transport sector; and (ii) experience of Detailed Design of Multilane Road (length greater or equal to 80 Km) or consulting service for the detailed engineering survey and design of multilane roads and bridges having consulting amount of minimum USD 2.0 million US$.

International firms are encouraged to form association with national consultants. Estimated 55 person-months of international experts, 163 person-months of national professional experts are estimated to carry out the assignment. However, the firm should assess their own estimates of professional input requirements. The qualification requirement for evaluation of key experts is set out in **Annex 2**. Tentative person-month detail required for assignment is provided under Table-4, however, the consultant to assess and proposed the required input to complete the scope of services.

International and national key experts identified in the technical proposal shall not be substituted without prior written DoR approval. Substitutions shall possess at least substantially equal abilities and qualifications. Substitution requests shall include a narrative detailing the circumstances and reasons for the substitution and evidence that the proposed replacement personnel possess at least substantially equal ability and qualifications.

Table-4: Staff Input (Tentative)

A. INTERNATIONAL PROFESSIONAL EXPERTS

Position	Quantity	No. of Person-Months	Total Person Months
Team Leader (TL) / Senior Highway Engineer	1	13	13
Sr. Bridge Design Engineer	1	11	11
Support Experts on Bridge design	1	10	10
Sr. Geotechnical Engineer	1	10	10
Sr. Highway/Pavement Engineer	1	7	7
Sr. Road Safety Engineer	1	4	4
Sub-Total	**6**		**55**

B. NATIONAL PROFESSIONAL EXPERTS

Position	Quantity	No. of Person-Months	Total Person Months
Deputy Team Leader/Senior Highway Engineer-1	1	13	13
Highway Engineer	2	11+7	18
Bridge Design Engineer	5	12+4x11	56
Structural Engineer	1	6	6
Geotechnical Engineer	2	12+10	22
Material Engineer	1	4	4
Road Safety/Traffic Engineer	1	10	10
Hydrologist	2	10	20
Procurement Specialist	1	2	2
Environment Specialist	1	6	6
Social Development/ Resettlement Specialist	1	6	6
Sub-Total	**18**		**163**

Note:

1. *The above key staff composition and estimated total key staff man-month is Client's estimate. The consultants are advised to assess their own requirement and propose their own staff composition and staff input requirement for efficient performance of their job as per the Terms of Reference. If the proposed consultant's team is found inadequate or not sufficient during the performance of the services then additional staff shall be provided by the consultant at their own cost.*
2. *A Technical Proposal shall be considered unsuitable and shall be rejected for further evaluation if it does not respond to important aspect of TOR.*

5. Reporting Requirement and Time Schedule

The consulting services shall be implemented over 13 (thirteen) calendar months from the commencement date.

The consultant shall submit the reports minimum 10 hard copies and soft copy in specified manner and as enumerated in Table-5: Reports and Submissions.

The consultant shall initially submit 2 copies of documents/reports as draft in ring/spiral binding form. After approval from the client, the consultant shall submit the remaining 10 copies of each report in book binding form. The consultant shall sign and stamp on all the pages of Design documents, drawings, estimates, rate analysis, investigation report etc., before submitting to the client. All the reports shall also be submitted on electronic copy compatible with respective program on which they are prepared. All the alignments, including bridges, shall be tracked on GPS and shall be submitted on compatible format. The consultant shall also produce separate colored posters in appropriate paper size of each roads and bridge showing detailed plan, profile and other relevant information.

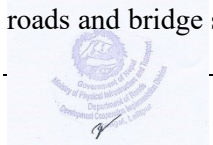


Table-5: Reports and Submissions

No.	Preparatory Outputs	Submission Deadline (no. months after the	Remarks
i	Inception Report	1.0	
ii	Submission of Concept design report with possible alternatives for road and bridges to initiate presentation/ discussions with the DOR team. Also should include the preliminary assessment report on environmental and social issues along the road and bridges. Concept design should base on the Field Survey Reports: Inventory, condition Survey, ground survey mapping, Traffic Volume Counts and Updated Recommendations, Hydrological, geological and Soil Investigation Reports, Environmental data, Social data, road crash data, road safety audit	4.0	
	Present, review, discuss on the concept design and alternative selection, and finalize/ select the design concept for road alignment, pavement, geometric standards, structures, drains, cross drainage structures, junctions, road safety features, bridge design including the approach and the river training works, as necessary		To be completed as soon as possible to move forward for detail design. DoR may use individual experts to review the concept design
iii	Draft Design Report : On the basis of selected concept and standards, prepare and submit Draft Design Reports for road and bridges including the Design , Drawings, reports on Environmental assessment, Social assessment, geological/ geotechnical, hydrological, construction material, rate analysis, cost estimate, draft bidding documents with specification	10	
	Present, review, discuss on the concept design and alternative selection, and finalize/ select the design concept for road alignment, pavement, geometric standards, structures, drains, cross drainage structures, junctions, road safety features, bridge design including the approach and the river training works, as necessary		
iv	Final design report: On the basis of review feedback and comments of Draft, finalize and submit the Final Design report for road and bridges including detail design, the drawings, reports on Environmental assessment, Social assessment,	13	

No.	Preparatory Outputs	Submission Deadline (no. months after the	Remarks
	geological/ geotechnical, hydrological, road safety audit, construction material, rate analysis, cost estimate, bidding documents with specification and EMP. The final report shall also include the animated video showing the existing road/ bridges with proposed design. Including the updated Drone information they need to update based on final design.		
v	Monthly Progress Report	Within one week of the end of each calendar month	

5.1 Inception Report

1. Complete report detailing the consultant's intended means, methods, design standards, reference documents to be used, and assumptions for design. The report should effectively demonstrate that the consultant possesses a firm grasp on the required scope of work.
2. Thoroughly review the feasibility study / planning reports prepared by a separate consultant, and provide a summary of the reasonableness of these studies and their recommendations. Prepare a detailed plan for how these recommendations will be designed and implemented, to include color coded location maps, a summary of each improvement, and a narrative plan for how design will be carried out for each improvement.
3. Prepare a quality assurance / quality control (QA/QC) plan for the necessary, investigation and design review process. Ensure that all major project deliverables conform to accepted design practices and comply with national and international design standards and best practices as appropriate. The QA/QC Plan shall contain procedures that will be used to ensure that a quality product is provided for each design component and deliverable and shall list what documentation will be submitted to verify that the procedures have been followed. Include sample checklists, or similar documentation, that will be used to indicate that an internal quality review has been performed.
4. Prepare a survey plan that summarizes the methodologies and instrumentation proposed to provide the survey mapping accuracies required for effective design and construction. It is incumbent upon the consultant to ensure that the survey plan and survey will result in sufficient mapping to complete all design and environmental permitting activities associated with this project.
5. Prepare a field investigation plan. This shall include pavement condition surveys proposed, drilling and sampling of existing pavement, proposed geotechnical drilling and soil sample location maps, and a narrative summary.
6. Prepare a complete schedule (Gannt or bar chart) of the survey, investigation and designer's activities to complete all items required in this scope, clearly depicting the critical path(s) and the float for each activity. Provide a narrative detailing any foreseen schedule risks and the designer plan for mitigating any future schedule issues.
7. Prepare for the construction cost estimate.

5.2 Concept Design Submission

Prepare conceptual level drawings and reports depicting preliminary items of work and impacts that include:

1. High-level location maps that include plan view schematic locations of the work.
2. Roadway drawings that include typical sections, plan and profile sheets (where the alignment is changing) or straight-line schematic sketches with chainage (where the alignment is not changing), critical cross sections, locations of existing and proposed key features such as bridges, flyovers, pedestrian crossings, wildlife crossings, bus lay bys, buildings, retaining walls, noise walls, median crossing locations, roadside barrier, and other ancillary features, locations of existing and proposed culverts and drainage structures, horizontal and vertical locations of all existing utilities, and mapping and topography, represented on plan and profile sheets.
3. Plans and cross sections for all major and unique junctions.
4. Typical plans, typical cross sections, and locations for all minor junctions.
5. Conceptual-level type, size, and location drawings for each proposed bridge, flyover, wild life crossings, pedestrian crossing, and other structures.
6. Complete detailed benefit cost analysis and life cycle cost analysis for each bridge, considering different bridge types, alignments, widths, and other design features.
7. Preliminary land acquisition plans if required for the work, depicting the proposed limits of work, the existing and proposed right of way, proposed full and partial, land acquisition takes, and summary table of proposed takes for each impacted parcel.
8. Include detailed geotechnical report providing boring logs, materials lab analyses results, geotechnical analyses, and design recommendations. Recommendations are to be incorporated into concept and final design.
9. Prepare concept design report, including information on the proposed design standard and with the design work completed at this stage.
10. Provide information necessary for designer and stakeholders to make key decisions prior to starting work on detailed design. Key decisions requiring DoR approval prior to proceeding with detailed design may include but are not limited to: i) locations of flyover ramps, pedestrian crossings, wildlife crossings, bus lay bys, etc., ii) junction types, turning lanes, and conceptual plan drawings, iii) bridge construction schematics (i.e. concentric vs. eccentric, iv) bridge types selected for each bridge, v) whether to design structures and the roadway to accommodate cost-effective future widening, and vi) other items as appropriate.
11. The designer shall prepare concise and informative summaries informing each decision using decision matrices summarizing the key benefits, risks, and costs for each option, the designer's recommended option, and a narrative summarizing the reasons for the designer's recommendation.

6. Consultants Facilities, Client's Input and Counterpart Personnel

(a) The consultant shall be fully responsible to moblize the necessary key staff and also should arrange all the administrative, technical and support staff needed to carry out the services. The inputs provided in part 4 of this ToR are the minimum inputs required and the consultant is required to assess the works requirement and may add additional inputs (Engineers, Technical Support, Administrative Support, specialists etc.,), as required and should propose the additional inputs in their technical proposal and financial proposal. The consultant shall also be responsible for providing all other necessary facilities and logistical support for its staff

including accommodation, transportation, office equipment, communications, utilities, office supplies and other miscellaneous requirements that are required to complete all the tasks to fulfill the objective and scope of woks, and it shall be included in their financial proposal.

The consultant shall arrange the necessary air transportation, land transportation including necessary vehicles for all type of surveys to deliver their services, effectively. The consultants shall also arrange accommodation, travel and visas necessary for International staffs.

The consultant shall establish an office space at Kathmandu (within 2 Km radius of DCID Office at Jwagal, Lalitpur for better coordination) and other sub offices as necessary to complete the job. The consultant shall arrange necessary furniture, fittings, equipment and materials in order to provide fully functioning and usable facilities and to provide the consultant's staff with the necessary resources for the administration, detail study and reporting of the works.
The Consultant shall be fully responsible to manage the necessary tax/ VAT registration and necessary payment and clearance on the same.

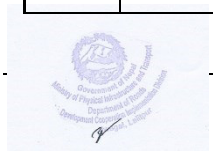
7. Data and Assistance to be Provided by the Client

The Client will provide all the available study reports and related information available with the Client. The Client will also help the consultant team to coordinate with the DOR offices, Bridge Branch, and other governmental offices for related activities, as necessary. For the approved international staff, the Client may support the Consultant to process visa.

ANNEX-1: List of Existing Bridges

S.No.	Bridge/ River Name	District	MRM Chainage, Km	Length of Bridge (m)	Carriageway Width (m)	Span No	Bridges under 50 m	Remarks
1	Kamala	Siraha	237.32	640	7	24		
2	Kamala Canal	Siraha	238.40	70.4	7	5		
3	Chamnath	Dhanusha	241.645	322	7	15		
4	Baluwa	Dhanusha	245.39	111	7	7		
5	Jagadav Branch	Dhanusha	251.1	26.6	7	1	Yes	
6	Jagadav	Dhanusha	251.39	96	7	4		
7	Jalad	Dhanusha	252.96	266	7	10		
8	Aurahi	Dhanusha	255.061	329	7	12		
9	Basai	Dhanusha	256.715	96	7	4		
10	Sukhajor	Dhanusha	259.23	44.2	5.5	2	Yes	
11	Barahari	Dhanusha	261.54	75	7.5	3		
12	Ratu	Dhanusha	265.82	225.3	5.5	12		
13	Ratu Chahara	Mahottari	266.72	18.8	5.5	2	Yes	
14	Bhapsi	Mahottari	268.73	50.46	5.5	4		
15	Atabbe	Mahottari	269.97	28.6	5.5	3	Yes	
16	Janga Pul-1	Mahottari	271.3	75	5.5	6		
17	Gaushala	Mahottari	271.595	37.5	5.5	3	Yes	
18	Gadhanta	Mahottari	271.95	62.5	5.5	5		
19	Belgachhi (Dhungre Khola)	Mahottari	275.4	38.1	5.8	4	Yes	
20	Tuteshwor	Mahottari	276.105	19	5.5	2	Yes	
21	Maraha Bridge	Mahottari	277.559	132	5.5	8		
22	Maraha Kholsi Pul/ Batuwa Khola	Mahottari	278.83	19	5.5	2	Yes	
23		Mahottari	279.385	38	5.65	4	Yes	

S.No.	Bridge/ River Name	District	MRM Chainage, Km	Length of Bridge (m)	Carriageway Width (m)	Span No	Bridges under 50 m	Remarks
24	Tuteshwor - 2	Mahottari	280.5	19	5.5	2	Yes	
25	Jarlahi (Kholsi Pul)	Mahottari	281.064	19	5.5	2	Yes	
26	Batuwa/ Budakhola	Mahottari	282.49	28.5	5.6	3	Yes	
27	Bankhe	Sarlahee	283.3	102.5	5.5	6		
28	Amuwa	Sarlahee	286.26	18.65	5.5	2	Yes	
29	Phuljor	Sarlahee	290.8	87.4	5.5	7		
30	Kalinjor - 1	Sarlahee	292.5	28.5	5.5	3	Yes	
31	Kalinjor - 2	Sarlahee	293.35	63.4	5.5	3		
32	Betini	Sarlahee	294.77	12	8	2	Yes	
33	Dumdume	Sarlahee	296	18.7	5.5	2	Yes	
34	Bastipur	Sarlahee	296.94	18.8	5.3	2	Yes	
35	Lakhandei	Sarlahee	301.19	204.55	5.5	12		
36	Chapani	Sarlahee	302.3	66.4	5.6	3		
37	Bastol	Sarlahee	303.164	20.8	5.5	2	Yes	
38	Sukhapokhari	Sarlahee	306.235	20	5.5	2	Yes	
39	Rai Bridge/ Harion Khola	Sarlahee	308.265	38	5.7	4	Yes	
40	Dumajor	Sarlahee	310.516	37.5	5.5	4	Yes	
41	Godari	Sarlahee	312.055	19.4	5.5	2	Yes	
42	Bagmati	Sarlahee	313.53	363.5	5.5	11		
43	Bagmati East	Sarlahee	313.93	11.3	5.5	1	Yes	
44	Bagmati West	Rautahat	314.23	11.57	6.8	1	Yes	
45	Gairi	Rautahat	314.594	34.25	5.5	3	Yes	
46	Gairi Khola	Rautahat	315.445	11.5	5.5	1	Yes	
47	Paurai	Rautahat	318.38	66.4	5.5	3		



S.No.	Bridge/ River Name	District	MRM Chainage, Km	Length of Bridge (m)	Carriageway Width (m)	Span No	Bridges under 50 m	Remarks
48	Lachkan	Rautahat	319.74	22.67	5.7	2	Yes	
49	Katha Ko Pul/ Geedibela	Rautahat	324.165	46	5.6	4	Yes	
50	Chandi	Rautahat	325.8	165	5.5	5		
51	Dhou	Rautahat	327.94	22.5	5.5	2	Yes	
52	Jungle Tole	Rautahat	328.74	34.08	5.5	3	Yes	
53	Amu -1	Rautahat	330.27	34.08	5.5	3	Yes	
54	Amu - 2	Rautahat	331.505	22.73	5.5	2	Yes	
55	Kathi	Rautahat	333.31	56.8	5.5	5		
56	Lamaha	Rautahat	334.43	65.9	5.5	2		
57	Kali Khola	Rautahat	335	34	5.5	3	Yes	
58	Dhansasr	Rautahat	339.92	164.6	7.5	8		
59	Lamopul	Bara	342.77	45.4	5.5	4	Yes	
60	Bhamara	Bara	344	32.89	5.5	1	Yes	
61	Rampul	Bara	344.6	22.5	5.5	2	Yes	
62	Bakeya	Bara	347.715	355.59	5.5	16		
63	Unasi	Bara	349.51	89.6	5.5	8		
64	Terhakilo	Bara	354.21	45.6	5.5	4	Yes	
65	Barahakilo	Bara	355.26	34.0	5.5	3	Yes	
66	Pasaha	Bara	357.875	165	5.5	5		
67	Pasaha Branch	Bara	358.07	22.2	5.5	2	Yes	
68	Bangandi	Bara	359.145	113.6	5.5	10		
69	Balganga	Bara	361.59	67.1	5.5	3		
70	Baijura	Bara	363.55	46.1	5.5	4	Yes	
71	Dudhaura	Bara	364.263	89.3	5.5	4		
72	Dhungre - 1	Bara	365.163	22.8	5.5	2	Yes	
73	Dhungre - 2	Bara	365.385	23.3	5.5	2	Yes	
74	Dui Number	Bara	366.47	23.16	5.5	2	Yes	
75	Tin Number	Bara	367	34.74	5.5	3	Yes	
76	Ek Number	Bara	367.225	11.45	5.5	1	Yes	
			Total	**6055**				

ANNEX-2: QUALIFICATION REQUIREMENTS OF KEY EXPERTS

A. INTERNATIONAL KEY EXPERTS

1.	**Team Leader** (Experience of the last 20 years will only be considered)	
i.	**Educational Qualification**	
	Minimum Master's degree in Transport Engineering/Highway Engineering/ Bridge Engineering. Preferable with the post Master's degree specialization in road and bridges	
ii.	**Experience**	
	• Total general Experience	20 years.
	• Experience in Related Field	15 years in Road and Bridge Works
	• Experience in the Proposed Field of Expertise	Minimum 10 years' experience as a Team Leader (Design) and experience of minimum 2 similar road/ bridge design projects of size more than US $ 350 million,
		Preferable: more number of similar project design works. Experience in wide geographic regions.
iii.	**Language**	Communicate fluently in English Language
2.	**Senior Highway Engineer** (Experience of the last 15 years will only be considered)	
i.	**Educational Qualification**	
	Minimum Master's degree in Highway Engineering. Preferably post master's degree in the Highway or related engineering.	
ii.	**Experience**	
	• Total Experience	15 years
	• Experience in Related Field	12 years in Road Works
	• Experience in the Proposed Field of Expertise	Minimum 10 years' experience as Highway Design Engineer and design experience of at least 4 similar Road projects of four lane =>50Km Length
		Preferable; more number of similar project. Experience in wide geographic regions.
iii.	**Language**	Communicate fluently in English Language
3.	**Sr. Bridge Design Engineer** (Experience of the last 18 years will only be considered)	
i.	**Educational Qualification**	
	Minimum: Master's degree in Bridge Engineering/Structural Engineering. Preferably post master's degree in the Bridge / structural engineering.	

ii.	**Experience**	
	• Total Experience	18 years
	• Experience in Related Field	15 years in Bridge Engineering/Structural Engineering Works
	• Experience in the Proposed Field of Expertise	Minimum 10 years' experience in Bridge design and experience of design of 5 major motorable bridges (two or more lane width bridges of each with Total length=>100m)
		Preferable ; experience of design of motorable bridges of more than =>300 m length; use of state of art technology in bridge design; Experience in wide geographic regions.
iii.	**Language**	Communicate fluently in English Language
4.	**Bridge Design Engineer (Support Expert on Bridge Design)** (Experience of the last 15 years will only be considered)	
i.	**Educational Qualification**	
	Graduate in Civil Engineering with preferably Master's degree in Bridge Engineering/Structural Engineering	
ii.	**Experience**	
	Total Experience	15 years
	Experience in Related Field	12years in Bridge Engineering/Structural Engineering Works
	Experience in the Proposed Field of Expertise	Minimum 10 years' experience as a Bridge design Engineer and experience of design of 3 major motorable bridges (more than two lane width of Total length>100m)
		Preferable; experience of design of motorable bridges of more than =>300 m length; use of state of art technology in bridge design; Experience in wide geographic regions.
iii.	**Language**	Communicate fluently in English Language
5.	**Sr. Geotechnical Engineer** (Experience of the last 15 years will only be considered)	
i.	**Educational Qualification**	
	Minimum Master's degree in Geotechnical Engineering/Engineering Geology. Preferable post Master's degree in Geotechnical Engineering/Engineering Geology or related field	
ii.	**Experience**	
	• Total Experience	15 years
	• Experience in Related Field	12 years in Road and Bridge related works
	•	Minimum 10 years' experience as Geotechnical Engineer for Bridges and specific experience of geotechnical investigations for at least 5 motorable Bridge (more than two lane width of Total Length =>100m) and at least geotechnical investigations for Two road of Length= >50Km) especially for design purpose.

		Preferable ; specific experience of geotechnical investigations for more motorable Bridge of Total Length =>300m; more geotechnical investigations for road design of Length= >50Km), especially for design purpose; Experience in wide geographic regions.
iii.	**Language**	Communicate fluently in English Language
6.	**Sr. Road Safety Specialist** (Experience of the last 15 years will only be considered)	
i.	**Educational Qualification**	
	Minimum Master's degree in Transport Engineering/ Highway Engineering/ Traffic Engineering/ Road safety. Preferable post Master's degree in Traffic or Road safety related subject or Certified Road safety auditor	
ii.	**Experience**	
	• Total Experience	15 years
	• Experience in Related Field	12 years in Road and Bridge Works
	• Experience in the Proposed Field of Expertise	Minimum10 years' experience as Road Safety Specialist/ Audit and similar experience of design and or road safety audit for 5 Road projects=>50Km length of similar nature ie; at least 4 lane road .
		Preferable: more number similar experience of design and or road safety audit for Road projects =>50Km length; Experience in wide geographic regions.
iii.	**Language**	Communicate fluently in English Language

B NATIONAL KEY EXPERTS

1.	**Deputy Team Leader/ Highway Engineer** (Experience of the last 15 years will only be considered)	
i.	**Educational Qualification**	
	Minimum Master's degree in Transport Engineering/ Highway Engineering. Preferably post master's degree in the Highway or related engineering field.	
ii.	**Experience**	
	• Total Experience	15 years
	• Experience in Related Field	15 years in Road design and supervision
	• Experience in the Proposed Field of Expertise	Minimum 10 years' experience as Highway Design Engineer and minimum similar experience of design for 4 Road projects=>50Km length of =>2 lane roads
		Preferable; more similar experience of road design projects=>50Km length; experience as Team leader/ Deputy Team leader in design Road projects=>50Km length ; Experience in design of =>4 lane roads; Experience in projects funded from the World Bank or similar other International Organization.
iii.	**Language**	Communicate fluently in English Language

2.	**Highway Engineer** (Experience of the last 15 years will only be considered)	
i.	**Educational Qualification**	
	Minimum Master's degree in Transport Engineering/ Highway Engineering. Preferably post master's degree in the Highway or related engineering field.	
ii.	**Experience**	
	• Total Experience	15 years
	• Experience in Related Field	10 years in Road design and supervision works
	• Experience in the Proposed Field of Expertise	Minimum 8 years' experience as Highway Design Engineer and minimum similar experience of design for 4 Road projects=>50Km length of =>2 lane roads
		Preferable; more similar experience of road design projects=>50Km length; Experience in design of =>2 lane roads; Experience in projects funded from the World Bank or similar other International Organization.
iii.	**Language**	Communicate fluently in English Language
3.	**Bridge Design Engineer** (Experience of the last 15 years will only be considered)	
i.	**Educational Qualification**	
	Minimum Master's degree in Bridge Engineering/Structural Engineering; preferable post Master's degree in Bridge/ Structure Engineering	
ii.	**Experience**	
	• Total Experience	15 years
	• Experience in Related Field	10 years in Road and Bridge Works
	• Experience in the Proposed Field of Expertise	Minimum 8 years' experience as a Bridge Design/ Supervision Engineer and Minimum similar experience of design of 4 major motorable bridges (Total Length=>100m).
		Preferable: more similar experience of detail design of motorable bridges (Total Length=>100m); experience of design of bridges of total length =>300m) Experience in projects funded from the World Bank or similar other International Organization.
iii.	**Language**	Communicate fluently in English Language
4.	**Structural Engineer** (Experience of the last 15 years will only be considered)	
i.	**Educational Qualification**	
	Minimum Master's degree in Structural Engineering. Preferable post Master's degree in structural engineering.	
ii.	**Experience**	

	Total Experience	15 years
	Experience in Related Field	12 years in Road and Bridge related Works
	Experience in the Proposed Field of Expertise	Minimum 10 years' experience as a Structural Design Engineer for road and bridge structures, and similar experience of 4 projects of similar nature (Road Projects of => 50km OR major motorable bridges (Total Length=>100m).)
		Preferable: more similar experience of design of road and bridge related structures roads =>50 km OR bridges of total length =>100m Experience in projects funded from the World Bank or similar other International Organization.
iii.	**Language**	Communicate fluently in English Language
5.	**Geotechnical Engineer** (Experience of the last 15 years will only be considered)	
i.	**Educational Qualification**	
	Minimum Master's degree in Geotechnical Engineering/Engineering Geology; Preferable post master's degree in Geotechnical Engineering/Engineering Geology or related field	
ii.	**Experience**	
	• Total Experience	15 years
	• Experience in Related Field	10 years in in Road and Bridge Works
	• Experience in the Proposed Field of Expertise	Minimum 8 years' experience as a Geotechnical Engineer/Engineer Geologist in road and bridge related works; and minimum experience of geotechnical investigation and design of 5 projects of Road Length =>50Km) OR Bridge of Total Length =>100m).
		Preferable: more similar experience of geotechnical investigations and design of road projects =>50 km OR bridges of total length =>100m. Experience in projects funded from the World Bank or similar other International Organization
iii.	**Language**	Communicate fluently in English Language
6.	**Materials Engineer /Pavement Engineer** (Experience of the last 15 years will only be considered)	
i.	**Educational Qualification**	
	Minimum Master's degree in Highway Engineering/Pavement engineering/Geotechnical Engineering Preferable post Master's degree in Highway pavement or construction materials or related field	
ii.	**Experience**	
	• Total Experience	15 years
	• Experience in Related Field	12 years in Road and Bridge Works

	• Experience in the Proposed Field of Expertise	Minimum 10 years' experience as a Material Engineer/Pavement Engineer for road and bridge works; and minimum similar Experience of 4 projects of Bridge works of Total Length =>100m OR Road works of Length =>50Km) .
		Preferable: more similar experience as Material/ Pavement Engineer for design / supervision of bridges of total length =>100m OR road projects =>50 km. Experience in projects funded from the World Bank or similar other International Organization
iii.	**Language**	Communicate fluently in English Language
7.	**Road Safety/Traffic Specialist** (Experience of the last 10 years will only be considered)	
i.	**Educational Qualification**	
	Minimum Master's degree in Highway /Traffic Engineering/ Road safety or related works. Preferable post Master's degree in Traffic or Road safety related subject or Certified Road safety auditor	
ii.	**Experience**	
	• Total Experience	10 years
	• Experience in Related Field	8 years in Road and Bridge related safety works
	• Experience in the Proposed Field of Expertise	Minimum 8 years' experience as a Road Safety/ Road safety audit works in road; and minimum similar experience of road safety audit/ design of 3 road projects of similar nature (Road Length=>50Km)
		Preferable: more similar experience as Road safety design/ Audit of Roads projects =>50 km; experience as Road safety design/ Audit of Roads with =>4 lane width. Experience in projects funded from the World Bank or similar other International Organization
iii.	**Language**	Communicate fluently in English Language
8.	**Hydrologist** (Experience of the last 15years will only be considered)	
i.	**Educational Qualification**	
	Minimum Master's degree in Hydrology/ Engineering Hydrology or related subjects. Preferable post Master's degree in the Hydrology/ Engineering Hydrology or related subjects.	
ii.	**Experience**	
	• Total Experience	15years
	• Experience in Related Field	12 years in Road and Bridge Works
	• Experience in the Proposed Field of Expertise	Minimum 10 years' experience as a Hydrologist and experience of design for roads and bridges; and similar experiences of 4 projects of Bridge Design of each Total Length =>100m OR Road Length =>50Km)

		Preferable: more similar experience as Hydrologist of projects of Bridge Design of each Total Length =>100m OR Road Length =>50Km); Experience of Bridge Design of each Total Length =>300m Experience in projects funded from the World Bank or similar other International Organization
iii.	**Language**	Communicate fluently in English Language
9.	**Procurement Specialist** (Experience of the last 15 years will only be considered)	
i.	**Educational Qualification**	
	Minimum Master's degree in Engineering/ Contract Management/ Construction Management/ Law/ related field	
ii.	**Experience**	
	• Total Experience	15 years
	• Experience in Related Field	12 years in procurement field related to Road and Bridge works
	• Experience in the Proposed Field of Expertise	Minimum 10 years' experience as Procurement specialist in road and Bridge related works ; and minimum experience of preparation of International bidding/ contract documents for 3 projects of similar nature of Road / Bridge works
		Preferable: more similar experience of preparation of International bidding/ contract documents as Procurement specialist of projects of Road / Bridge works; Experience in preparing the bidding documents using World Bank, ADB guidelines or FIDIC documents
iii.	**Language**	Communicate fluently in English Language
10.	**Environment Specialist** (Experience of the last 10 years will only be considered)	
i.	**Educational Qualification**	
	Minimum Master's degree in Environmental Engineering/Environmental Science or related field. Preferable post Master's degree in the Environmental Engineering/Environmental Science or related field.	
ii.	**Experience**	
	• Total Experience	10 years
	• Experience in Related Field	8 years in Road and Bridge Works
	• Experience in the Proposed Field of Expertise	Minimum 8 years' experience as an Environmental Specialist in road and bridge related works; and similar experience in design or supervision of of 3 projects of similar nature of Road length =>50 km.
		Preferable: more similar experience as Environmental Specialist for road projects of Road length =>50 km Experience in projects funded from the World Bank or similar other International Organization
iii.	**Language**	Communicate fluently in English Language

11.	**Social Development/Resettlement Specialist** (Experience of the last 10 years will only be considered)	
i.	**Educational Qualification**	
	Minimum Master's degree in Social Science/Sociology/ Anthropology or related field. Preferable post Master's degree in Social Science/Sociology/ Anthropology or related field.	
ii.	**Experience**	
	• Total Experience	10 years
	• Experience in Related Field	10 years in Road and Bridge Works
	• Experience in the Proposed Field of Expertise	8 years' experience as Social Development Specialist/Resettlement Specialist/Livelihood Specialist in road and bridge related works; and similar experience in design or supervision of 3 projects of similar nature of Road length =>50 km.
		Preferable: more similar experience as Social Development Specialist/Resettlement Specialist/Livelihood Specialist for road projects of Road length =>50 km Experience in projects funded from the World Bank or similar other International Organization
iii.	**Language**	Communicate fluently in English Language