Appendix - A

TERMS OF REFERENCE
FOR
FEASIBILITY STUDY OF WATER TRANSPORT ALONG KOSHI,GANDAKI AND BHERI RIVER BASIN

==

Name of project : Feasibility study of water transport along Koshi,Gandaki and Bheri River Basins

Name of River : Koshi,Gandaki and Bheri River

Location : Various river basins

Project code : NA

==

1. INTRODUCTION

The Ministry of Physical planning and works singhadarbar, Kathmandu, intends to utilize services of engineering consulting firms well experienced in the fields of water transport ,hydrological analysis ,river training works, environment aspects, transportation planning and management etc. for providing engineering consulting services for Detail Feasibility study of water transport of Koshi, Gandaki and Bheri River Basins including measurement of obstruction along the river, it's cost estimate.

2. OBJECTIVE

Objective of this job is to study the Feasibility of water transport along the Koshi, Gandaki and Bheri River Basins and upgrading the existing motor boat services which are providing service at some location. The Detail Feasibility study is to be prepared considering the upgrading existing water transport with safety and give assess to remote people and it's future reliability and scope in transporting the rural agricultural product and providing the services.

3. SCOPE OF WORK

The scope of work to be carried out by the consultant shall include but may not be limited to the following:

3.1 Desk study:

A desk study should be carried out, collecting all data, maps and information relevant to water transport and reviewing them for use in the proposed project.

3.2 Detailed Engineering Study and Survey:

Detailed engineering study shall include the following:

3.2.1 Technical Feasibility study:

It should include reviewing the available data, collecting, reviewing and analysis of field data to be used in the study of water transport along Koshi, Gandaki and Bheri River Basins and conducting analysis to decide upon the technical feasibility of the River Transport. A cost comparison of different types of water transport shall be made and discussed with the MOPPW.

In this study the following points related to the river and its catchment area shall the considered:

(i) Topography
(ii) Nature of flow, maximum and minimum discharge and it's depth at critical points
(iii) Nature and structure of local as well as regional geology
(iv) Other information as needed.

3.2.3 Water Transport route Selection

The most suitable routes for the water Transport assessed on the above characteristics along the Koshi, Gandaki and Bheri River as well as the catchment area shall be selected. The selected route should be clearly indicated in the map and critical obstruction should be reported.

3.2.4 River corridor Survey

In the Koshi,Gandaki and Bheri River Basin the following shall be studied

a) The feasibility study will include over view of required infrastructure, shipping and boating service, safety practices, legislation and intuitional and policy frame work governing the sub-sector.

b) Review the demand for all economically feasible roots of water transport system along the proposed site of koshi, Gandaki and Bheri river basin and determine the beneficiaries willing ness to pay for the services

c) Alignment Profile, river cross section at narrow/critical locations.

d) Study and report the Major settlement along the river corridor contributing to the route.

e) Expected volume of goods and passenger transport

f) Study of existing system of water transport including its merit and drawbacks and recommending appropriate improvement for the same.

g) Modeling of future demand over 10-30 years with market share scenarios linked to the identification of key route /supply hypotheses including completion of visual survey and survey of people's view about traveling by water.

h) Detail measurement of critical obstructions along the river transport pathway, its tentative quantity and cost for clearing them

i) Identify issues and problems experienced by small boat operators traveling in open waters over large distances under risk. Propose Network or system that allows operators to arrive safely at their destinations and possible protected location that facilitate the exchange for goods and passengers.

3.2.5 Hydrological Study

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

(ii) Catchment area of the river Basin.
(iii) Length of the river from origin up to Last station.
(iv) Possibility of change of catchment
(v) Nature, size and quantities of debris carried by the river
(vi) Intensity, duration and distribution of rain in the catchment
(vii) Vegetation, cultivation etc. of the catchment.
(viii) Existence of reservoir's, Lakes etc. in the catchment.
(ix) Existing bridge or other hydraulic structures across the river in the vicinity of the proposed river transport with their obstruction and clear height details as much as possible.
(x) General slope of the river from the critical point (origin) of the river up to possible downstream of the River.
(xi) Cross sections at critical locations
(xii) Bed slope of the river at stations points
(xiii) Maximum discharge calculated by established formulas with different return periods and the peak discharge observed over a period of 100 years.
(xiv) Velocity and depth of flow at the time of survey.
(xv) Shifting of the river in the past at proposed River Transport route and in its vicinity.
(xvi) Other information required for river control, design, construction and maintenance of the water transport.

3.2.6 Consideration on Environment Protection

The consultant shall predict damages to the Environment including Landscape and attempt to mitigate or minimize the damages by choosing River transport system. And suggest appropriate measures in the water transport system for protection of surrounding Environment. The GON environmental policies, Environmental Protection Act and Environmental Protections Rules should be followed.

3.3.6 Other information

Availability of construction materials like, sand gravel boulders, timber, etc. with their engineering properties, quantities and lead up to site. Quarry site of materials with their available quantities should be shown on a sketch plan with reference to route.

3.4 Analysis of Data, Conclusion and Recommendation of Design Parameters.

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 and recommend the most cost effective sustainable system of water transport.

3.5 Miscellaneous

If not covered by aforesaid, the Consultants shall perform other studies, explorations, tests surveys, calculations, etc. required to produce full and complete set of drawings, specifications, requirement of materials and cost for the water transport including related works based upon which Detail engineering survey and design of feasible routes can be started.

3.6 Design and estimates

Based on the collected information and results of the discussions mentioned above the consultants shall design the transport system following the standard codes of practice, norms and guidelines.

3.6.1 **Use of Standard Design(s) and software**

Depending upon the site condition and other factors the Consultants can use the Standard Design and software of the part(s) of the system. This matter will be discussed and finalized during the presentation of the Draft Report.

3.7 The checklist

The detailed requirements of the study report are given in the checklist at the end of this TOR. Before submitting the report the consultants should verify whether it complies with the checklist.

4. SUBMISSION OF REPORTS AND PRESENTATION OF THE WORKS

In accordance with standards and procedures the consultant shall submit his reports as under:

4.1 Desk Study Report

This report will contain findings of map study as well as the study of available reports. Desk Study report shall be submitted to MoPPW in two copies and should be discussed with the project. This should contain Index map as well as map of the proposed routes with respect to complete road network and river system of the district/region.

4.2 Preliminary/Field study Report

This report shall contain the preliminary design/study concepts and short descriptions relating to the proposed system and its major components. It shall include location of stations proposed along the route this report shall be submitted in **three** copies and the content shall be discussed with MoPPW **before proceeding to the detailed report**.

4.3 Draft Report

This report shall in all respect be complete, containing all the required components of the study/design and be presented in clear and easy to refer formats as per the general design guidance attached. The complete set of the report shall consist of:

- (i) Volume I – Main Report
- (ii) Volume II – Drawings/Maps
- (iii) Volume III – Calculations and type designs
- (iv) Volume IV : Subsidiary details, if any
- (v) Appendices

Please refer to the checklist provided with this TOR for number of copies and detailed requirements of the reports.

Presentation of the Draft Report

The Consultants shall present the Draft report in specified format and defend it to the MoPPW audience prior to the submission of the final report. They shall review the issues raised during the presentation while finalizing the report and make necessary amendments/corrections if needed. The date and venue of the presentation shall be determined by mutual agreement between the Project and the consultants. The cost of such presentation shall be born by the consultants.

4.4 Final Report

Apart from the presentation, the Project will verify the content of the report against the Terms of Reference and the checklist. The Project may also discuss upon the technical content of the report and may suggest some changes if thought necessary. While preparing the Final Report the consultants shall consider the comments/suggestions and make corrections or amendments if required. It does not, however, relieve the consultants of their responsibility over the technical content of the design. The final report shall be submitted in stipulated number of copies as indicated in the checklist.

4.4 Soft copy (electronic copy) of the study

Apart from the bound report the consultants shall submit soft copies (electronic copies) of the final report in CD-ROMs as specified in the checklist.

5 TIME SCHEDULE

If not indicated otherwise in the contract documents the consultant shall complete the assigned works as per the following schedule:

(i) Desk study Report & Preliminary Design Report within 1 (one) months starting from the date of signing of the Agreement.
(ii) Draft Report within 5(five) months starting from the date of the submission of the field report.
(iii) Final Report within 3 (three) weeks after receiving Project's Comments and suggestions on the draft report.

6 USE OF COMPUTERS

The Consultant is encouraged to use computers and appropriate analysis and design software. If such software is used the report should contain information on:

- Basic methodology of the analysis/design procedure adopted in the software
- Modeling concepts and applied model(s)
- Input and output parameters

7 WORKING TEAM

The working team for field and office works should necessarily consist of the following Key Personnel together with adequate supporting manpower.

SN	Personnel	Minimum academic qualification	Minimum years of general experience
1	Team Leader (Highway Engineer)	Master's in Highway / Transportation Engineering	10 years
2 3 4	Alignment Engineer Structural Engineer Geotechnical Engineer / Engineering Geologist	Master in Highway /Transportation Masters in Structure/ Bridge Engg Master's in Geotechnical Engineering / Engineering Geology	7 years 7 years 7 Years
5 6 7 8	Hydrologist Environment Engineer Economist Civil Engineer	Master's degree in Hydrology/Water resource engineering Master's degree in Environment Master's degree in Economics Master's degree in civil Engineering	7 years 7years 7 Years 7 years
9 10 11	Senior Surveyor Quantity Surveyor Rafting guide	Graduate in Survey Bachelor in civil Engg/Quantity Survey Professional experience	7 years 7 Years 5 years

4. STAFFING REQUIREMENT

It is estimated that approximately 52 Person-months of professional staff input advised in the team composition will be required for carrying out the consultant's services. In addition to the professional staff mentioned in the team composition other technical and administrative support staff that will be required for satisfactory completion of the services shall be estimated and included by the consultant in the Financial Proposal.

Estimated Team Composition (Key Staff)

Note: The above professional staff composition and total estimated staff person-month is client's suggestion as a minimum requirement. The consultants are advised to propose their own staff composition and staff input requirement in addition to the above for efficient performance of their job as per the Terms of Reference. If the proposed consultant's team and inputs is found inadequate by the client during the performance of the service, then additional staff shall be provided by the consultant at their own cost.

7. CONSULTANTS FACILITIES

It should be noted that the consultant will need to provide all the administrative, technical professional and support staff needed to carry out their services. The Consultants will also be responsible for providing all other necessary facilities and logistical support for its staff, including accommodation, vehicles, miscellaneous transportation, office equipment, Survey & investigation equipments, laboratory testing, communications, utilities, office supplies and other miscellaneous costs for carrying out the services as per the requirement of the TOR.

8. DATA AND ASSISTANCE TO BE PROVIDED BY THE CLIENT

The following shall be provided to the Consultant by MOPPW

- Related and available reports of past studies, if any.
- Access to all other available necessary documents and data available in MOPPW required for the performance of the consultant's services
- Where required provide assistance to collect data /information from relevant GON offices and Departments.
- Assistance in obtaining visa and work permits if international expert is involved.

9. CONTRACTUAL ARRANGEMENTS

The Consultant's contract will be with Government of Nepal, Ministry of Physical planning and Works and will be based on a contract agreement consistent with the Public Procurement Monitoring Office guidelines and documents for consultancy services contracts.

10. QUALIFICATION AND RESPONSIBILITIES OF KEY STAFF

(a) Team Leader/Highway Engineer (6 Person Months)

The Team Leader will take the overall responsibility of day to day operation of the Feasibility study and shall co-ordinate and supervise and guide the multidisciplinary team of professionals on all aspects of the Feasibility study. He/She will be responsible to the Project Coordinator of the MoPPW. He/She will also maintain contact and liaison with MoPPW, Construction Division to ensure that the feasibility study is conducted in accordance with the government's policies and objectives. .

The office of the Team Leader will be based in Kathmandu or in a suitable central location as agreed with MOPPW to facilitate the study of the proposed waterway corridors

The Team Leader should be a Graduate in Civil Engineering and preferably have:

a Master's Degree in the field of Transportation Engineering/Civil Engineering

- 10 Years experience in civil engineering secxtor and
- 7 years of specific experience in Roadway Feasibility Study/Detail Design.

He/She should have completed at least two assignments comprising Roadway Feasibility Study/Detail design (50km length or more) Projects as a Team Leader.

(b) Alignment Selection Engineer(2Nos. totalling 10 Person Months)

He/She will be responsible for selection of the waterway alignment and feasibility design operations. He should have good experience in roadway/waterway route alignment and preparation of cost estimate.

He/She should be a Graduate in Civil Engineering and preferably have:

- Master's Degree in Transport Engineering/Civil Engineering
- 7 years of experience in Road sector,
- 5 years specific experience in Roadway design / Alignment design.

He/She should have completed at least two assignments comprising Feasibility Study/Detail design as a design engineer/alignment engineer.

(c) Structural Engineer (2 Person Months)

He/She will be responsible for assessment of required structures and protections based on field and desk studies data. He/She will prepare preliminary civil engineering design and cost estimate for feasibility study purpose of miscellaneous structures and other civil engineering structures and facilities. He/She should be a Graduate in Civil Engineering and preferably have:

- Master's Degree in Structure/ Bridge Engineering,
- 7 years of experience in civil engineering structures,
- 5 years specific experience in Roadway civil engineering Structures/Bridge Design.

He/She should have completed at least two assignments comprising Roadway Feasibility /Detail design Study Projects as a Structure design/bridge Engineer.

(d) Geo-technical Engineer(4 Person Months)

He/She will be responsible for reporting the geological situation of the waterway alignment and feasibility design operations. He should have good experience in selection of geologically safe and sound roadway/waterway route alignment selection.

He/She should be a Graduate in Civil Engineering and preferably have:

- Master's Degree in Geo-tech Engineering/ Engineering Geology
- 7 years of experience in Civil Engineering sector
- 5 years specific experience in Roadway design / Alignment design.

He/She should have completed at least two assignments comprising Feasibility Study/Detail design as a Geo-tech engineer.

(e) Hydrologist(3.5 Person Months)

He/She will be responsible for selection of the waterway alignment and feasibility design operations. He should have good experience in hydrology related to roadway/waterway route alignment.

He/She should be a Graduate in Civil Engineering/ Hydrology and preferably have:

- Master's Degree in Hydrology/ Water resource Engineering
- 7 years of experience in civil engineering sector,
- 5 years specific experience in hydrology related to Roadway design / Alignment design.

He/She should have completed at least two assignments comprising Feasibility Study/Detail design as a Hydrologist.

(f) Economic and Financial Analyst (3.50 Person Months)

He/She will be responsible for preparation of econometric database and carrying out economic and sensitivity analysis for assessment of economic viability by means of Economic Internal Rate of Return (EIRR). Further He/She shall be responsible for carrying out financial and sensitivity analysis for assessment of financial viability by means of financial Internal Rate of Return (FIRR) and recommending feasible financing alternative structures and implementation structures for the project.

He/She should be a Graduate in Economics and preferably have:

- Master's Degree in Economics / Financial Management/ MBA in Finance,
- 7 years of expertise related experience in any sector,
- 5years specific experience as Economic and Financial Analyst in Road sector.

He/She should have completed at least two assignments comprising Feasibility / Detail design Study Projects as an Economic and Financial Analyst.

g) Civil Engineer (2 persons totaling 8 Person Months)

The responsibility of this position is to assist and support the Team Leader.

He/She should be a Graduate in Civil Engineering. He/She should preferably have:

- Master's Degree in the field of Transportation Engineering
- 7 Years experience in Railway/road sector and
- 5 years relevant experience in Railway/Road Feasibility Study/ Detail Design.

He/She should have completed at least two assignments comprising Road Feasibility Study (30km length or more) Projects as a Highway Engineer/Civil Engineer.

h) Environmental Expert (4 Person Month)

He/She will be responsible for preparing environment assessment review frame work and assessment of each project's environmental impact, identifying mitigation measures and cost, resources needed to implement the mitigation measures. He/She will also prepare an initial environmental examination (IEE) report and Terms of Reference for EIA. Quantify the environmental benefits of implementing the project in comparison to the use of road to cater the traffic demand in cooperation with Economic and Financial Analyst.

He/She should be a Graduate in Environmental Sciences/Environmental Engineering/Civil Engineering and preferably have:

- Master's Degree in Environmental Sciences/Environmental Engineering,
- 7 years of related general experience in any sector,
- 5 specific project experiences as Environment Expert in Road Sector.

He/She should have completed at least two assignments comprising Road /Feasibility /Detail design Study Projects as an Environmental Expert.

i) **Quantity Survey Engineer (3 Person Month)**

*He/She will be responsible for preparation of preliminary cost estimates for the project in close coordination with other professional staffs***.**

He/She should be a Graduate in Civil Engineering/Quantity surveying and should have:

- 7 years of general experience in civil engineering sector
- 5 years of specific experience in Road sector,

He/She should have completed at least two assignments comprising Road Feasibility /Detail design Study Projects as a Quantity Survey Engineer.

j) **Senior Surveyor (5 Person Month)**

The responsibility of this position is to conduct field surveys and assist Alignment Design Engineers to fix the control points and the alignment.

He/She should be a Graduate in Survey and should have:

- 7 years of general experience in the field of survey and
- 5 years of specific experience in survey of transportation projects

He/She should have completed at least two assignments comprising Railway /Road Feasibility /Detail survey Projects as a Senior Surveyor

k) **Rafting Guide (3 Person Month)**

The responsibility of this position is to assist towards safe waterway transportation to conduct field surveys and assist Alignment Design Engineers to fix the control points and the alignment.

He/She should be a Professional Guide and should have:

- 5 years of specific experience as Rafting Guide

Note:

i) The above mentioned professional staffs are the minimum requirement as estimated by MoPPW. In addition to the above staff, the Consultants shall estimate and propose any additional professional staffs and required technical and other support staff for the execution of the services as per the requirement of the TOR.
ii) The Quantity Survey Engineer and the Senior Surveyor shall not be evaluated for marking. However, they should meet the minimum qualification requirements.

8 DEFECT LIABILITY

8.1 Responsibility for survey and design

Submission of the final reports does not relieve the consultant from their responsibility to the design. They shall bear full responsibility for:

(i) Authenticity of all the field data including socio-economic, environmental, topographic, hydrological and geological information;
(ii) Correctness of the design and all the calculations (except for the Standard Design, if used);
(iii) Correctness of the drawings;
(iv) Correctness of any other details related to construction

8.2 Acceptance of responsibility

The Consultants may be asked to submit signed Statement of Acceptance of Responsibility as mentioned above in sections 8.1 and attached together with the final report.