

TERMS OF REFERENCE

For

Services Package No. BRWTP-S15/1: Design and development of AIS (Automatic Identification System) to monitor vessels and Aids to navigation

The Project at a Glance

Title of the Project	Bangladesh Regional Waterway Transport Project1 (BRWTP-1)
Implementing Organization	Bangladesh Inland Water Transport Authority (BIWTA), Ministry of Shipping (MoS)
Package Name of Consultancy Services	Design and development of AIS (Automatic Identification System) to monitor vessels and Aids to navigation
Package Number	Service No. BRWTP-S15/1
Market Approach	Open-International
Procurement Method	Quality- and Cost-Based Selection (QCBS)
Type of Contract	Lump-Sum
Assignment Duration	Twenty four (24) months
Location of Assignment	Within project area
Funding Source(s)	IDA (Credit No. 5842-BD)
Contracting Entity	Project Director, BRWTP-I Project, BIWTA

1. Introduction

- 1.1. Bangladesh lies predominately within the Bengal basin, the world's largest delta formed by the Ganges, Brahmaputra (Jamuna) and Meghna (GBM) river system and its tributaries and distributaries. It has over 700 rivers, streams and canals with a total length of about 24,000 kilometres (km). Approximately 6,000 km are navigable during the monsoon (wet) period for different size vessels, shrinking to about 4,000 km in the dry periods.
- 1.2. Inland Water Transport (IWT) carries over 50 percent of all Bangladesh's cargo traffic and one quarter of all passenger traffic. There are over 22,300 registered vessels engaged in this trade. In addition, there are approximately 750,000 unregistered country boats of a great variety of shape and size. These play a vital role in the transport of goods and people, especially on the smaller rivers.
- 1.3. The IWT sector is dominated by the private sector, which has invested heavily in shipping. It is represented by various associations, including: the Coastal Ship Owners Association, the Cargo Vessel Owners Association, the Tanker Owners Association and the Launch (Passenger) Vessel Owners Association.

- 1.4. Despite its size, IWT faces regulatory and safety challenges. Though Bangladesh is a signatory to all of the main international maritime conventions and does have rules governing the construction and operation of both sea-going and inland (non-convention) ships, many of these are dated. There is also a lack of mechanisms and capacity to ensure that the rules made to reduce the risk of accidents are consistently enforced. While it does have substantial salvage capacity, it often does not have mechanisms to respond to distress situations that can lead to casualties. Though some casualties are caused by weather, structural, mechanical or equipment failure, most shipping casualties in Bangladesh result from commercial pressure, a major factor in all sub-standard operations. This generally leads to overloading (especially in respect to passenger vessels operating in peak holiday periods), which is a major cause of capsizes and loss.
- 1.5. A lack of information and guidance to mariners also impacts negatively on shipping safety. While Bangladesh does provide some meteorological warnings and prevents vessels from departing its ports (including the inland ports) during adverse weather conditions, there is very little information available to mariners when on a voyage. Bangladesh does not publish sailing directions and despite producing navigation charts for the major rivers, these are not disseminated to mariners and most vessels operate without the same or any positioning fixing equipment of any kind. Moreover, very few vessels are provided with radar allowing them to navigate during reduced visibility conditions, including rain and fog – which is common at night during the period of the SW monsoon and in the early morning in the months of November to February. During such periods, most (but not all) vessels will anchor or proceed at very slow speeds to avoid risk of collision, though not all emit sound or other alert signals. Use of radiotelephony, especially VHF, is also very limited and most vessels do not maintain a listening watch on general or distress frequencies. No use is made of digital selective calling for sending pre-defined digital messages, nor, outside the main sea ports, are there dedicated facilities for receiving or responding to distress messaging.
- 1.6. Despite this, the quality of seamanship is actually quite good and there is high degree of local knowledge of route and other conditions. Nearly all vessels obey rules for the prevention of collisions at sea and with the exception of some of the smaller country boats, all vessels are equipped with navigation lights. Nearly every vessel is also equipped with fog horns and powerful searchlights - typically mounted on the bow, used to detect other vessels, riverbanks and other key hazards to navigation (such as bridges and other structures). Some aids to navigation are provided on the major routes, mainly buoys marking the lateral limits of navigation channels and positioned at key points on the rivers. Where provided, these generally comply with International Association of Lighthouse Authorities (IALA) recommendations for navigation in region 'A' and some display lights for recognition during darkness. Provision of aids to navigation is however complicated by the changing nature of the rivers and none comply with standards of availability required for safe navigation purposes.
- 1.7. The development and control of Inland Water Transport is the responsibility of the Bangladesh Inland Water Transport Authority (BIWTA), under the Ministry of Shipping (MoS). Its functions include but are not limited to:
- Providing aids to navigation;
 - Disseminating navigational and meteorological information including publication of river charts;

- Providing pilotage and hydrographic survey services;
- Carrying out removal of wrecks and obstruction in inland navigable waterways;
- Conducting traffic surveys to establish passenger and cargo requirements on the main rivers, feeders and creek routes;
- Developing rural water transport by progressing of schemes for modernizing and mechanizing country craft;
- Ensuring co-ordination of Inland Water Transport with other forms of transport, with major sea ports, and with trade and agricultural interests for the optimum utilization of the available transport capacity;
- Conducting research in matters relating to Inland Water Transport;
- Arranging programs of technical training for Inland Water Transport personnel
- Maintaining liaison with the shipyard and ship repair industry to meet the requirements of the Inland Water Transport fleet;

In addition, it performs a regulatory function, including but not limited to the inspection of inland vessels to ensure compliance with shipping ordinances and regulations.

1.8 In order to improve key multi-modal transport corridors and networks that would address current transport bottlenecks in Bangladesh, the World Bank is financing the Bangladesh Regional Waterway Transport Project 1 (BRWTP1).

Major Components of BRWTP1 includes the following:

- Component 1: Improved Inland Waterway Navigation;
- Component 2: Improved Services at Priority Inland Waterway Terminals and Landing Stations; and
- Component 3: Institutional Capacity Development and Sustainability.

1.9 The BRWTP-1 project under Component-3 plans to install an Integrated Automatic Identification System (AIS) Network and River Information System (RIS) for the surveillance, monitoring and management of vessel traffic and Aids to Navigation (ATN) on the main Dhaka – Chattogram inland waterway traffic route and Dhaka, Narayanganj, Ashugani, Ghorashal, Barishal linked routes.

1.10 The primary focus of the assignment is to provide a centralized method of monitoring and managing vessel traffic and the functioning of major Aids to Navigation (ATN) using Automatic Identification System (AIS) technology. This is intended to:

- Improve regulatory and safety compliance of all vessels above 300 gross tonnage and upwards engaged on international voyages, cargo ships of 500 gross tonnage and upwards not engaged on international voyages and all passenger ships irrespective of size in with the provisions of the International Convention for Safety of Life at Sea (SOLAS), Chapter V
- Ensure an ATN availability of 99.8% in accordance with the both the International Association of Lighthouse Authorities (IALA) guidance on availability objectives and the PIANC Guidelines and Recommendations for River Information Services

The AIS system, which shall as a minimum be designed to relevant International Maritime Organisation performance specifications will be supported by a series of AIS Stations that will be strategically located to maximize coverage of the inland waterway traffic routes and will be used for the acquisition of AIS data (AIS data from vessels and ATN) and the transmission of that data to the Control and Monitoring Centre (CMC). The CMC will incorporate a state of the art maritime awareness (surveillance, monitoring and

awareness) software platform that will allow for 24/7, comprehensive monitoring and communication capabilities. The system will allow BIWTA to:

- Monitor both vessels and ATNs on a 24/7 basis through provision of static, dynamic and other information needed to maintain an efficient Vessel Traffic Service (VTS);
- Provide the capability for messaging using Digital Selective Calling (DSG)
- Communicate over VHF radio and or other telecommunication means,
- Enhance the ability to provide effective incident management and support and for play-back capabilities during incident investigation;
- Acquire and store AIS data for use in future planning exercises;
- Support safer pilotage;
- Monitor compliance of all vessels to local vessel registration and inland waterway safety requirements;
- Automatically register vessels and track registration and certification status;
- Monitor illegal activities and non-compliance to existing inland waterway vessel traffic rules and regulations; and
- Tracking vessels through EXISTING CCTV surveillance AT SELECT LOCATIONS to prevent the attempt to flee by causing accidents (In case of intentionally shutting down the AIS system).

2. Objectives

2.1 The purpose of the assignment is, taking into account BIWTA'S intentions and requirements as stated in section 1.10, to develop a detailed design and plan for the implementation of the Integrated AIS Network System for use by vessels on inland waterway routes and for interrogating ATNs. This will include:

- I. identification of the most appropriate AIS communication technologies;
- II. identification of the most appropriate locations for the AIS Stations, and
- III. the design and configuration of all system components taking into account IMO performance specifications, local environmental and other conditions.

2.2 All parts of the study are expected to run concurrently and the Consultant is expected to deliver each in a harmonized and logical manner. The Consultant shall be responsible for evolving an appropriate methodology based on the tasks as elaborated in the scope of works that is acceptable to BIWTA. The Consultant shall furthermore undertake all fieldwork and ensure all data and information gathered is quality assured and corrected wherever appropriate. Any qualitative assessments must be backed up by case studies and relevant industry examples.

3. SCOPE OF WORK AND DELIVERABLES

The assignment will include the development of the AIS through a number of key steps and deliverables (but not limited to) as detailed below:

- (i) Development of a stakeholder engagement plan in coordination with BIWTA to identify the various stakeholders involved in the implementation and operation of the AIS . The stakeholder

engagement plan shall I be used to gather data, feedback and input that BIWTA can use to make informed decisions on key aspects of the assignment;

- (ii) A preliminary vessel traffic analysis will be carried out. This analysis shall include identification of the sizes, types and numbers of different ships in the target area, i.e., Chattogram-Dhaka-Ashuganj IWT Corridor and linked routes with Barishal & Narayanganj, including a study into the current use of AIS technologies by such vessels, including all vessels above and below that required to be fitted with AIS under SOLAS regulation V/19 - Carriage requirements for shipborne navigational systems and equipment. The analysis shall furthermore include an overview of nationwide AIS use and coverage and where possible, use of historical AIS data and AIS density maps and an investigation into the occurrence of reported incidents;
- (iii) A preliminary ATN analysis will be carried out to identify the type and location of major ATN installed or planned for installation within the target area as detailed in target area mentioned in (ii) above;
- (iv) Development of concept design and network architecture, outlining the main components of the system, and how they will communicate and integrate. The concept design shall include provision for the acquisition of static and voyage data, which for vessels shall as a minimum include: the name and registered number of the vessel; its type, dimensions, draft, destination and ETA; its position ((latitude/longitude - up to 0.0001 minutes' accuracy), its navigation status, it's bearing/heading, course over ground, speed over ground, rate of turn, and time that all subject data was generated. For ATN, the system shall as a minimum be capable of obtaining the ATN name and registered number, its position and its functional status where fitted with a navigation light, Rarar beacon or other electronic aid. The concept design shall furthermore include the identification of preliminary locations for the AIS shore Stations and preliminary propagation modelling to show overall coverage of the system. The concept design will also include a draft design of the AIS Stations and AIS Control and Monitoring Centre (CMC) layout;
- (v) Physical site survey and assessments for the preliminary locations for the AIS Stations will be carried out. These site assessments will include physical walkovers and investigations into the suitability of the sites and their practicality for installation of AIS Stations;
- (vi) The final Design shall be carried out after stakeholder engagement/consultation and the completion of site assessments. The final design will include confirmation of coverage through propagation modelling based on actual site data for the AIS Stations. The final design will also include a list of final requirements for the AIS Monitoring Stations, including details on power supplies and a confirmation of the preferred technologies to be used for data transmission. The final design will also include a summary of main requirements for the AIS CMC, including a network diagram, software, and communication requirements and the number of supervisors or operator stations required. The final design shall be in sufficient detail to allow potential bidders to clearly understand the basic requirements of the system;
- (vii) Development of a detailed budget for implementation of the assignment. This shall include the expected budget, with a break down in accordance with BIWTA's preferred bidding arrangement and shall also include a forecast of ongoing communication costs associated with the transmission of data from AIS Remote Stations to the AIS monitoring and Control Centre and a detailed forecast of maintenance and support costs;
- (viii) Consultant (firm/JV of firms) shall carry out the design of the AIS system and prepare Bidding Documents such as: *BRWTP-G7 (Lot-2)- Software and hardware for AIS, BRWTP-G8- Software and hardware for ferry safety* and so on as assumed necessary under this project;
- (ix) Providing technical support to procurement of related goods packages and capacity building/on-the-job training of BIWTA's counterpart operating staffs;

- (x) Assist the Client understanding/taking over the installation, commissioning and trial run of the AIS, ECDIS and related devices from the vendor(s)/supplier(s);
- (xi) A guideline to the Chronology of Activities to be undertaken by the Consultant (but not limited to) in time bound manner and suggested plan is tabulated below:

Deliverable Number	Deliverable/Activities	Expected Completion (weeks after Commencement)
(i)	Development of Stakeholder Management Plan	4
(ii) & (III)	Preliminary vessel traffic analysis (<u>available</u> secondary data will be supplied by the Client)	8
(iv)	Development of Concept Design comprising of on-board devices in the vessels(Ship borne navigation equipment and systems) and ATNs	16
(v)	Site assessments for AIS Stations	18
(vi)	Development of Final Design	20
(vii)	Cost feasibility and project budget	22
(viii)	Development of bidding documentation for related goods' packages	22-32
(ix)	Providing technical support to procurement of related goods items	Throughout the procurement process
(x)	Capacity building/on-the-job training of BIWTA's counterpart operating staffs	Up to the end of contract period subsequent to installation, commissioning and trial run of the AIS

4. Pre-Requisites of the Consultants' team

The Consultant shall engage Highly Qualified professionals for this assignment. The Consultants' team will be responsible for the full scope of work and must possess following capabilities:

- a. Qualified and Experienced in the field of Maritime Transport and Marine Aids to Navigation (ATN);
- b. The team will support the development of the AIS design and carry out the analysis and site survey and investigation required to identify the most appropriate system design and hardware and software requirements;
- c. The Consultant as a team should have personnel with the following minimum qualifications
 - i. Preferred qualification in relation to Maritime surveillance and monitoring systems or other Aids to Navigation systems, is IALA approved
 - Level 1 Aid to Navigation (ATN) Manager Certificate
 - Or,
 - Degree in Marine Aids to Navigation Management
 - ii. Participated and successfully/substantially* completed the Services foran AIS Project/ Coastal Surveillance of Minimum value amounting to US\$ 0.25 Million;

- iii. Minimum 8 years of experience in developing, maintaining and operating maritime surveillance and monitoring systems and/or Marine Aids to Navigation;
- iv. Possesses experience in designing and installing high-availability maritime and surveillance infrastructure using autonomous and reliable power supplies and communication technologies;
- v. Must Possess a strong understanding of international compliance to the requirements of organizations like the World Association for Waterborne Transport Infrastructures (PIANC), International Maritime Organization (IMO) and the technical, and operational standards of organizations like the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) and the International Telecommunication Union (ITU); and
- vi. Work experience in remote areas and high humidity / heat environments especially in South Asia/Asia-pacific regions will be advantageous.

Note: Substantially* - shall stand for 80% completion of a contract.

5. Payment Schedule

Deliverable/Output	Timeline	Payment
Advance Payment	Upon signing of Contract	10%
Inception Report	4 weeks after Contract signing	10%
Draft Report (including draft Bidding Documents for procurement of related Goods packages) followed by Bank's observations/comments and Presentation Workshop to acquire necessary feedback/suggestions.	32 weeks after Contract signing	40%
Final Report (including Bid Documents for procurement of related Goods packages)	40 weeks after Contract signing or two weeks after submission of Comments by the Employer	10%
Providing technical supports to procurement of related goods items	Throughout the procurement process	10%
Capacity building/on-the-job training of BIWTA's counterpart operating staffs	Up to the end of contract period subsequent to installation, commissioning and trial run of the AIS	20%

Note: Payments against deliverables shall only be made upon approval of the deliverables by the Client with consent of the World Bank Task Team.

6. Consultant Qualifications

The consulting services shall be carried out by a Consulting Firm with experience in: the Inland Water Transport; vessel operations; transport planning and technical innovation. The Employer estimates a minimum mandatory staffing Input as follows; however, the Consultant may propose additional experts if deemed necessary.

6.1 Key Staff Inputs

Key Professionals	Input Required (months) (intermittent, spread over the whole contract period of 24 months)
1. Team Leader cum RIS Expert	12.0
2. AIS Expert cum Deputy Team Leader	18.0
3. Local Field Level IWT Expert	8.0
4. ICT Expert	8.0
Total Key Professional Inputs	46.0

Note:

- a) *List of key professionals and person months is the minimum mandatory requirement. However, the Consultant is responsible to review the required services and shall propose own requirements for additional key professionals/person months as deemed necessary and support staff (e.g., Surveyor(s), enumerators, CAD operator, Office Manager-cum-Accountant, Driver (s), etc.) required to accomplish the proposed services in a satisfactory manner.*
- b) *Financial proposal should include all the direct and indirect costs necessary to execute the services and reporting as well as any public consultation. The Consultant shall provide all facilities and equipment to enable progress of the consultancy works to be completed. This shall include all logistic requirements for their professionals including support staff, office accommodation, equipment and supplies, vehicles, consumables and communications equipment. The Consultant will incorporate these costs in the financial proposal.*
- c) *The number of experts for different positions shall match with the Consultant's Technical Proposal.*

6.2 Qualifications and Responsibilities of Key Personnel

The preferred broad qualifications and responsibilities of the Key Personnel are given below:

6.2.1 Team Leader cum RIS Expert

Education: At least Bachelor degree in natural sciences, marine science, hydrogeology, hydro-ecology, geography or other adjacent fields.

Experience: 20 years of general experience with a minimum of 10 years' experience in shipping sector and at least 2 years of experience as Team Leader or other senior position in the shipping sector preferably in an assignment of similar nature. Should be familiar with PIANC and River Information Service with a minimum 5 years of professional experience in the field of water resources management, surface water assessment/monitoring in IWN routes. Knowledge in Chattogram-Dhaka-Ashuganj IWT corridor and linked routes shall be an added advantage. Excellent analytical and written skills in English. Computer literacy and skills to work with geographic information system software.

6.2.2 AIS Expert cum Deputy Team Leader

Education: At least Bachelor degree in a relevant subject, such as land surveying mapping and geospatial data science, earth science, geographic information science, geographic information technologies, geographical information systems (GIS), geography and geology, geomatics and geoinformatics or equivalent. However, for Captains of merchant ships educational requirement might be relaxed. Education background for Captains of merchant ships shall be reluctant.

Experience: Should have sound understanding and know-how with PIANC, RIS and at least 5 years' experience in design and development of AIS with all aspects including installation, commissioning and operations.

Captains of merchant ships with expertise in design and development of AIS shall be preferred.

6.2.3 IWT Expert

Education & Experience: Should have a Bachelor degree in Engineering, Geography or equivalent science discipline from reputed academic institution(s) with an extensive and varied experience of at least 10 years in handling large scale National/ Regional passenger and freight water Transport and Port infrastructures.

Should have experience in Water Transport and Port Systems and Traffic Analysis and Projections in at assignments in South Asia preferably in Bangladesh. Should possess clear inspiration about the IWT routes' connectivity and tidal scenario of Bangladesh.

6.2.4 ICT Expert

Education & Experience: Should have a Bachelor degree in ICT, CSE, EEE or equivalent advance science discipline from reputed university with an extensive and varied experience of at least 5 years in ICT related activities. Experience in AIS system shall be an added advantage.

7. Consultant's Obligations:

The Consultant (firm/JV of firms) shall be responsible to accomplishing the assignment using its team whilst the team members including the Team Leader's inputs are intermittent to be spread over the whole contract tenure of **24 months**. The Consultant shall undertake all fieldworks and ensuring all data gathered is quality assured and corrected wherever appropriate. The Consultant shall keep a record of all information collected and present this in a manner which allows statistical comparisons to be made. Qualitative assessments must be backed up by case studies

and relevant industry examples. The Consultant shall be fully responsible to conduct necessary survey, investigations and establish office(s) within the vicinity of the Employer's office, mobilize the required key professionals and supporting staff including necessary transport, communication, coordination, reporting, and conducting workshops to fulfill the objectives and deliverables mentioned in this TOR. Consultant's financial proposal shall include all the costs to complete this task. While performing the services, the Consultant shall exercise all reasonable skill, care and diligence in the performance of the study and shall carry out all responsibilities to recognized professional standards. The Consultant shall act as a faithful advisor to BIWTA and shall supply all expertise, knowledge, advice and skills required to carry-out and complete the assignment expeditiously in accordance with the conditions of engagement.

8. Employer's Obligations

BIWTA shall provide the Consultant free of charge, with the following:

- a) **Available** reports, formats, drawings, survey data, traffic studies/analysis etc. made in the past;
- b) Letters of Introduction of Consultant and objective of the assignment to all relevant Government Departments or Institutions for necessary coordination and collection of information.