

## Terms of Reference

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# **TRAINING COURSE FOR AERONAUTICAL METEOROLOGICAL FORECASTERS TO COVER ICAO (ANNEX III) AND WMO(BIP-M) REQUIREMENTS**

(Contract ID No: PPCR/DHM/S/IND -48)

January 2016



## **1. Background**

The objective of the BRCH project is to enhance government capacity to mitigate climate related hazards by improving accuracy and timeliness of weather and flood forecasts and warnings for climate vulnerable communities, as well as developing Agricultural Management Information System (AMIS) services, administered by the Ministry of Agriculture Development (MoAD), to help farmers mitigate climate related production risks. The project comprises four components:

- A. Institutional strengthening, capacity building and implementation support of DHM;
- B. Modernization of observation networks and forecasting;
- C. Enhancement of the service delivery system of DHM; and
- D. Creation of an agriculture management information system (AMIS).

Component A aims to develop and/or strengthen DHM's legal and regulatory frameworks, improve institutional performance as the main provider of weather, climate and hydrological information for the nation, build capacity of personnel and management, ensure operability of the future networks, and support project implementation. Component B aims to modernize DHM observation networks, communication and ICT systems, improve hydro meteorological numerical prediction systems and refurbish DHM offices and facilities. Similarly, Component C aims to enhance the service delivery system of DHM by creating a public weather service that provides weather and forecasts impact, and information services for climate-vulnerable communities and the key weather dependent sectors. Component D will provide critical and timely agro-climate and weather information as well as agro-advisories to farmers in order to increase productivity and reduce losses from meteorological and hydrological hazards.

## **2. Introduction**

The System Integrator (SI) of the BRCH project, led by the Finnish Meteorological Institute (FMI) has been appointed to develop a framework of capacity building for the DHM. The training program consists of short term (1-3 days) and medium term (4-15days) training modules consisting of lectures, workshops and hands-on training. Some training modules will be long term lasting up to one year. The providers of medium and long term courses will be selected based bidding for the most advantageous supplier of training services.

This ToR is for selection of training services to be provided by a single consultant and specifies the assignment to train a group of aeronautical forecasters or other personnel with meteorological educational background on Aeronautical Meteorological Services to meet the international qualifications by WMO for an aeronautical Meteorologist (BIP-M).

## 2.1 Present situation and planned enhancement of Aeronautical services in Nepal

Due to geographical features, importance of tourism and lack of roads the aviation is a very important transport sector in Nepal. Nepal has a total 48 airports. Currently international flights land only at Tribhuvan International Airport (Aerodrome code: VNKT), Kathmandu but the government is building two other airports for international flight operation. Besides VNKT there are four regional airports; Nepalgunj, Pokhara, Bhairahawa and Biratnagar. All domestic flights are operating (from VNKT) via regional airports to other domestic airports. Thus, regional airports have also important role in Nepalese transport. Airports in Nepal are showed in Fig. 1.

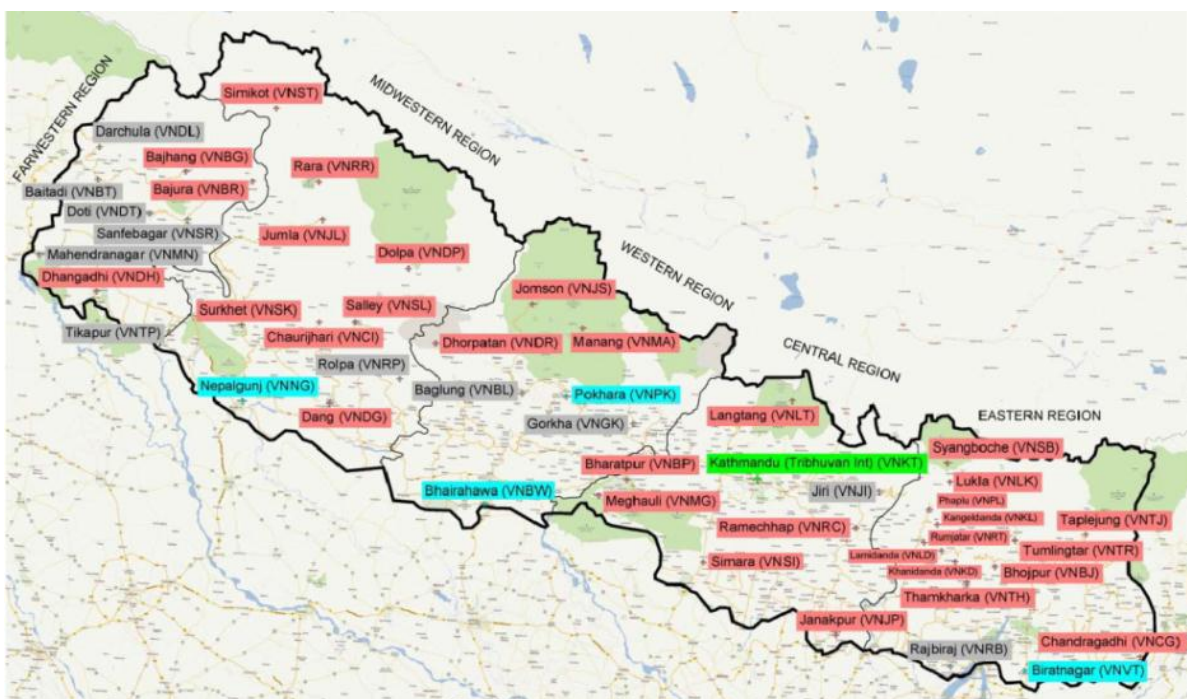


Figure1. Airports in Nepal. Green: international, blue: regional, red: domestic operational or charter, grey: inoperative<sup>1</sup>

ICAO Annex-3 has set recommendations and standards on aviation meteorological services provided for aerodromes and aviation operators. Aeronautical meteorological services should meet requirements of a Quality Management System (QMS), type of products and services, and human resources set by the international standards. Qualification of meteorologist and observation technicians should also be appropriately trained and competent according to internationally agreed requirements. Currently, DHM has challenges

<sup>1</sup> National Airports Plan – Current Situation and Diagnostics. Part of the project Capacity Development of Civil Aviation Authority of Nepal”. 2013. <http://www.caanepal.org.np/Notices/tiaip/National%20Airports%20Plan%20-%20Diagnosis.pdf>

to meet those requirements; partly due to lack of tools and real-time observations. Some requirements could be achieved by training, but some improvements need significant enhancement of DHM and production process; a task now being implemented by the BRCH project.

Currently, DHM is producing 24h TAF and TREND for VNKT, SIGMET for convective events, flight folder and phone service for weather related questions. ICAO Annex 3 includes standard for forecasted products, however, many of these products are not yet provided by DHM; e.g. information about upper winds and significant weather charts or TAFs for all airports used by commercial civil aviation. Aeronautical forecasts (TAF, SIGMET) are often based on latest METAR observation from VNKT and satellite pictures, but not on in situ observation from the airport used by the flights. In addition, cloud forecasts are based on NWP produced by India Meteorological Department (IMD). Rest of forecasted parameters are more or less based on expertise of the forecasters.

DHM has only limited number of observations and production tools for forecasting, which limits the added value of services. More training for the forecasters is also needed to use existing tools. A list of available observation and forecast data, and tools are listed below.

- Observations (15 SYNOP/AeroSYNO, VNKT METAR)
- MICAPS 3.11<sup>2</sup>
  - Satellite pictures; update 1/h, during monsoon 1/30min
  - Chinese NWP model T639 (pictures), 7 days
  - European Center NWP model (pictures)
  - Possible to combine satellite, model and SYNOP data
- Touch screen (Digital Atmosphere, USA)
  - Automatic SYNOP chart analysing tool
  - Plot SYNOP observations and soundings
  - Possible to include NWP, radar etc. data (this feature currently not in use)
- Freely available model data in internet e.g.
  - IMD (Indian WRF)
  - UK met office
  - GFS

One of the goals of the BRCH project is to support the CAAN to organize functions of the Meteorological Authority (MET inspector) in Nepal. In addition the project aims at establishing a contractual framework for cost recovery in aeronautical services. Also a Quality Management System in Aeronautical Services will be established to attain competitive position in case of these services being subject to competition.

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<sup>2</sup> *Meteorological products delivery system by China Meteorological Administration*

The BRCH project will establish an Aeronautical Weather Observing Systems (AWOS) at Tribhuvan International, Bhairahawa and Pokhara airports. Additionally Altogether 17 domestic airports will be equipped with automated weather stations. These systems include dual sensors for wind, visibility and cloud height measurement placed at opposite sides of the airfield. At Tribhuvan International Airport also a Runway Visual Range (RVR) sensor will be acquired to improve the observation of visibility in the presence of fog. In addition, visibility and/or cloud height will be measured at 13 smaller airports and at 5 sites along domestic flight routes to allow development for enroute flight weather forecasts.

### **3. Objective of the Assignment**

The objective of this assignment is to plan and implement training for DHM Aeronautical Meteorological Forecasters to attain capacity to provide high quality Aeronautical Meteorological Services in compliance with the requirements of International Aviation Organization (ICAO)<sup>3</sup> and World Meteorological Organization (WMO). The qualifications for an Aeronautical Meteorological Forecaster (AMF) are specified in the Basic Instruction Package for Meteorologist (BIP-M). The competency requirements for aeronautical meteorological personnel are specified in WMO Cg-16<sup>4</sup>

The objectives are more specifically to:

- Design a training course with appropriate contents to train the DHM Aeronautical Meteorological Forecasters to meet the required international standards (ICAO, Annex 3 and BIP-M)
- Instruct trainees to develop and document the Standard Operational Procedures (SOP's) to ensure operability of the future systems.
- To test the competency of the trainees
- Prepare concise report highlighting results of training, gaps in existing quality management systems, training, SOPs and how they can be strengthened going forward.

### **4. Scope of the Assignment**

As the main part of the assignment, the consultant shall provide training to selected DHM staff to attain competency as an Aeronautical Meteorological Forecaster based on the requirements set by ICAO and WMO. The assignment will also cover detailed planning of the training module for aeronautical forecasters. The assignment will start with evaluation of present competency of participating staff with respect to the WMO BIP-M -requirements.

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<sup>3</sup> ICAO, 2007: *Meteorological Service for International Air Navigation, Annex 3 to the convention on International Civil aviation, 8/07, E/P1/2000.*

<sup>4</sup> [WMO \(Cg-16 \(2011\) approved Meteorological Personnel Competency Standards](#)

Based on the results of gap analysis, the trainer will construct a learning path for each participant and plan the content and method of training. The consultant will also design methodology for testing attained competency level of participants at the end of training. The trainer shall issue certificates to the participants with reference to the type course, participant's name, tests passed and level of competency attained.

The course shall be interactive and include theory, practical demonstrations and hands-on training. Training should include visits to, but not limited to, the airdrome facilities, air navigation controls, runway maintenance and operative manager's work places.

The training will take place at the DHM Meteorological Forecasting Division at the Tribhuvan International airport in Kathmandu. The expected maximum number of trainees is 6 meteorologists. The Trainer shall plan the training course so that all listed topics are covered with sufficient detail in a maximum of 18 training days.

Training shall be organized on official working days from Sunday to Friday<sup>5</sup>, starting daily at 10:30 a.m. and ending at 4:30 p.m. Lunch break is between 13:00-and 13:45. Tea/ Coffee is made available/served by DHM during the course of the day. The Consult shall indicate in the training offer all requirements for the training facility and equipment needed.

The trainer shall specify the methods of training, e.g., but not limited to, consultation with trainees, basic lectures, hands-on training, exercises, assignments and written/ oral exams/tests.

All training material shall be submitted in appropriate digital form (e.g. .ppt, .doc, .pdf files) also including live videos covering the lectures and workshop presentations.

#### **4.1 Contents of training**

**Training course for Aeronautical Meteorological Forecasters:**

The content of this training course should cover at least, but is not limited to, the following topics:

- A. Introduction & general aspects
  - General purpose and content of aeronautical weather services,
  - Status of airports in Nepal,
  - Representative area and timing of observations
  - Monitoring and forecasting atmospheric phenomena of concern for aviation
  - What does competency mean, how is it tested?
  - Introduction to the international standards and competencies;
  - What are Standard Operational Procedures (SOPs)? How and for what

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<sup>5</sup> Excluding national holidays

purpose are they made?

**B . Assessment present weather situation and methods of forecasting**

- International Meteorological Aerodrome Reports (METAR, TREND, SPECI);
- Aircraft observations and reports
- Interpretation of soundings;
- Weather radar and Satellite imagery interpretation;
- Interpretation of Numerical Weather Prediction data and products
- Forecasts for landing and take-off,
- Forecasting aviation weather in mountainous regions;
- Severe phenomena: icing, severe convection, turbulence; low visibility; snow heavy rain, lightning; gust fronts, tropical storms
- Area forecast for low-level flights
- Aeronautical climatological information

**C. Constructing Service products**

- Significant Meteorological hazards (SIGMET and AIRMET information, Aerodrome Warnings, wind shear warnings and alerts);
- Terminal Aerodrome Forecasts, TAFs;
- World Area Forecast Centre (WAFC) charts;
- Significant Weather Charts (SIGWX);
- Information for air traffic services, search and rescue services, and aeronautical information services

**D. Miscellaneous topics**

- Factors affecting aircraft performance and fuel consumption
- Altimetry
- Service for Operators and flight crew members
- Requirement for and use of communications

**E. Standard operational procedures (SOP)**

- How to generate SOPs?
- Demonstration and instruction to prepare SOPs
- Hands-on exercises to generate the SOPs;

**F. Exercises, Exams and Tests for Competency**

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The consultant is requested to provide a preliminary training plan, based on the



above outline as part of his/her financial offer.

## **5. Reporting requirements, Time-line and deliverables**

The contract period will start from agreed start date of the training course and will last one week after the agreed end date of the course. The Trainer shall plan the training course so that all required topics are covered with sufficient detail so that the competency of trainees can be tested in a maximum of 18 training days. The Consultant is required to report on results of the Training to DHM by the end of the contract period. The consultant shall submit a detailed training plan and a Final report as follows. Both reports shall be submitted with 3 hard copies along with corresponding e-copies.

### **Detailed Training plan**

Based on the preliminary training plan, the consultant shall submit a detailed training plan latest two weeks before the agreed start date of training. The detailed training plan must, but is not limited, to include: goal of training, detailed list contents of the training course, proposed schedule, daily agenda's, training methods used, detailed arrangements of training as regards the training facility & equipment, required qualification of participants to attend the course, maximum number of participants, learning targets which comply with the international requirements quoted above, evaluation methods and scoring. The Consultant shall also express any needs of service from the customer side (DHM).

### **Final Report: Report on results of Training**

The Final Report shall be submitted within one week after completion of the course. The training report shall cover all training material (Submitted in the Annex) with in printed (3 copies) and digital form including video files of the workshops and lectures. The report shall consist of basic data of the courses (list of participants, daily agendas etc.), summary of course evaluations based on questionnaire submitted to the participants, and results on learning i.e. presentation of the competencies acquired by the participants including their ability to develop SOPs.

## **6. Client's Commitments (Inputs)**

Staff of DHM/PMU will provide basic organizational support to the Consultant. At the request of the Consultant, DHM should provide following documents.

- Information and data related to the project including information on status of observation networks, monitoring/lab equipment, communication, computing resources, and data processing tools;
- Project Appraisal Document (PAD), reports submitted by SI and other relevant publications;

- Other related documents if any in support of activities.

## **7. General Requirements of the Consultant**

The Consultant will act as a lead trainer (herein after called as Trainer) and is expected to have at least 5 years of working experience on holding training courses on Hydro-Meteorological Services both in developed and developing countries. The Trainer should have extensive experience in training meteorologists on Aeronautical Meteorology. The requirements for the Trainer are as follows. Effective work time is indicated in brackets.

### **7.1 Trainer in the field of Aeronautical Weather forecasting (1 month):**

The Trainer will be responsible for organizing and providing training in Aeronautical weather forecasting according to the standard requirement set by WMO. This will include lecturing on background theory of atmospheric phenomena and especially those which are of concern for flight safety in Nepal. The trainer will also be able to demonstrate and provide hands-on training on the tools for and operative aspects of aeronautical meteorological services. Trainees shall be also instructed by demonstration and hands-on exercises to prepare Standard Operating Procedures (SOPs) on the tasks of the subject area.

The Trainer on Aeronautical Weather Forecasting is responsible for

- Practical arrangements of the training
- Preparing the work plans and schedules
- Monitoring the implementation and budget of the training
- Reporting results of the training
- Networking with stakeholders, the DHM, SI and the Civil Aviation Authority of Nepal (CAAN)

#### **Qualifications:**

The Trainer must provide a CV, letter(s) of reference and other relevant references as evidence of the following qualifications:

- The Expert on Aeronautical Weather Forecasting should have a Master's degree or equivalent in Meteorology and/or Atmospheric Sciences,
- At least 10 years of experience in operational aeronautical weather services, particularly in weather forecasting phenomena of importance for aviation.
- At least 5 years of experience in organizing and giving training courses on aeronautical meteorology services that comply with the WMO and ICAO requirements (at least three (3) references.
- Co-operation skills, as well as a flexible, innovative and solution-oriented approach to work, customer-orientated mentality, cost awareness and ability to use ICT tools.

- Strong command with English language

## **8. Payment schedule**

- 10 percent of contract value on signing of contract as advance against a bank guarantee.
- 10 percent of contract value after approval by DHM on the Training Plan.
- 50 percent after completing all the training courses
- 30 percent of contract value after submission and acceptance of the Final report by DHM and SI.

## **9. Selection Criteria**

The consultant shall be selected through 3CV method based on the individual consultant selection method of the World Bank's Guidelines on "Selection and Employment of Consultants, January-2011, revised on April, 2015". Main criteria for the selection will be relevant work experience and qualifications.