REQUEST FOR QUOTATION

Geospatial Mapping and Monitoring using Drone Technology (Pilot)

Our Reference : PK-SPHFC-360857-NC-RFQ
Dated : 02 June 2023

1. The Government of Sindh has received credit through EAD, Govt. of Pakistan from the International Development Association towards the cost of Sindh Flood Emergency Housing Reconstruction Project (the Project). Sindh Peoples Housing for Flood Affectees (the Company) is implementing agency of the project. The Company intends to apply a portion of the proceeds of this credit to eligible payments under the Purchase Order/ Contract for which this RFQ is issued.

2. The Company now invites quotations for the Procurement of *Geospatial Mapping and Monitoring using Drone Technology (Pilot)*; the firms must have previous experience in a similar assignment.

   Detailed Terms of Reference/ scope is available on Company's website www.sphf.gos.pk

3. The received quotations will be evaluated as per 'RFQ' method of procurement in accordance the World Bank Procurement Regulations for IPF Borrowers dated July 2016 as revised through Fourth Edition, November 2020 available on www.worldbank.org. The acceptable terms and conditions of the lowest, responsive quotation shall be incorporated in the Purchase Order/Contract.

4. The quotation with complete details of firm's profile, general and relevant experience may be addressed and submitted to the Chief Executive Officer SPHF on the address below on or email before **16 June2023** during the business hours.

5. The quotation must be valid for atleast 30 days from the submission date and the quoted price should include all the applicable local taxes/duties etc.

6. Further information can be obtained at the address below during office hours.

--S/d--
Procurement Specialist– SPHF
procurementspecialist@sphf.gos.pk

Bungalow # 20 Block 7/8, Modern
Cooperative Housing Society,
Tipu Sultan Road, Karachi

Geospatial Mapping and Monitoring using Drone Technology (Pilot)

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Terms of Reference

Introduction and Objectives

The objective of using Drone Technology for Geospatial Mapping and Monitoring is to provide Sindh Peoples Housing for Flood Affectees (SPHF) with a detailed and accurate dataset on reconstruction of damaged houses in the 24 districts of Sindh using drone-based aerial surveys. The data collected will be used to i) monitor and report progress on reconstruction of houses, ii) using drone imageries for GIS mapping, and iii) informed decision-making.

In addition to housing units and land cover, the drone survey will collect topographic information to identify the elevation of the terrain and any changes that is natural or may have occurred as a result of natural disasters such as flooding and such drone imageries will be utilized for settlement development plans.

The drone surveys will be carried out in pre-defined areas where the housing reconstruction is being undertaken, and the locations of the area of interest will be shared during the project's course as and when the services are required.

Scope

The drone-based aerial survey will play a crucial role in monitoring, evaluation and reporting the housing reconstruction in Sindh. The survey will be carried out in pre-defined areas where the housing reconstruction is being undertaken. The specific locations of the area of interest are given in below.

The survey will be conducted using drones equipped with high-quality cameras capable of capturing visible imagery. This will allow the project team to identify not only the housing units but also vegetation and land cover changes, which can be used to assess the environmental impact of the housing reconstruction project.

The consultant/firm shall develop a comprehensive plan for the aerial survey which should include flight planning, logistics, and communication plan with local authorities. The consultant shall ensure all permits required for aerial survey are obtained with the assistance of the client before the commencement of the survey.

Proposed Plan

The services of firm(s) shall be engaged on a **pilot case basis** for specific area(s) of interest (AOI) as given below and assess the acquired data for its suitability for monitoring, reporting, planning and mapping purposes.

Logistics, and Communication Plan: The consultant shall develop a comprehensive plan for the aerial survey which should include flight planning, logistics, and communication plan with local authorities. The consultant shall ensure all permits required for aerial survey are obtained with the assistance of the client before the commencement of the survey.

Data Acquisition: The consultant shall conduct drone-based aerial survey for specific AOI as and required. The survey shall be conducted using a drone with a high-resolution camera that can capture images at a GSD of 4 cm or less. The survey shall be conducted during daylight hours, with favorable weather conditions.

Data Processing: The consultant shall process the collected data and generate high-resolution orthomosaic images, digital elevation models and contour maps. The images shall be georeferenced in UTM coordinate system. The consultant shall ensure that all data processing is done using standard procedures and the final outputs meet the required accuracy standards.

Documentation and Drone Training: Once a proven method and accuracy result is achieved, the consultant must make note or record the step they took. They will be required to measure and report on the accuracy achieved over the 'test best' to certify/register the drone, as well as the accuracy achieved over each AOI. This documentation on the process will then be use in a Guidance Note and for training and replication purposes by the project team and other personnel – if required.

Quality Control: The consultant shall conduct quality control checks at various stages of the survey and data processing to ensure that the final outputs meet the required accuracy standards. Depending on the specific needs, the consultant shall establish adequate ground control points (GCPs) to meet the quality and accuracy requirement.

Automation Methodology: The consultant shall further analyze the processed data and develop a methodology to automate project monitoring to the extent possible. This shall include delineating reconstructed buildings and classifying them by the stages of progress, i.e., foundation, plinth, lintel, and roof, and quantifying the number of buildings at the various levels of progress.

Pilot Project:

The drone survey will be carried in two pre-defined areas/dehs of district Jamshoro and Dadu and would be carried by two different consulting firms. Engaging two firms for the pilot is meant to learn the dynamics of use of drone imageries and assess the quality of outputs.

The specific area for the pilot case survey using drone technology would include the following;

1) AOI-1: Deh Wahur, UC Wahur, Taluka Sehwan, District Jamshoro (1,111 Unique Cases).
2) AOI-2: Deh Kamangar, UC Qazi Arif-19, Taluka Mehar, District Dadu (745 Unique Cases).

Proposed Outputs/Deliverables

- **Inception Report**: A comprehensive report detailing the proposed methodology, including flight plans, equipment used, and data processing techniques. The inception report shall also include the agreed outputs in the final report.
- **Draft Final Report:** This shall include the following;
    - A Digital Surface Model (DSM) that represents the height of all the surface of the landscape with a spatial resolution will include a set of maps and reports showing the spatial distribution of damaged and reconstructed housing units, as well as any land cover changes and topographic anomalies identified in the survey.
    - A Digital Elevation Model (DEM) that represents the changes in elevation of the bald earth with a spatial resolution.
    - A land use map of settlement within the proposed AIO shall be developed to help design the area development plans.
    - Quick-view thumbnail images in JPEG for orthophotos.
    - Data Products shall be shared both on a hard drive and through a cloud platform.
    - Documentation and readme files that includes metadata on each layer, including resolution, naming conventions (i.e., a data dictionary), and projection information. Reporting on any data gather problems and/or lessons learned are also expected to be reported.
    - Any other relevant information or analysis that may be required to support the monitoring and evaluation of the housing reconstruction project.
- **Presentation to the SPHF** on Draft Report/Outputs.

- **Final Report**: This shall include the report finalized, incorporating the comments of SPHF.

Data Standards/Requirements

- All 2D orthorectified mosaics as uncompressed GeoTiFF and JPEG2000, fully radiometrically/color balanced. Large mosaic files will be delivered as 1km x 1km tiles. Imagery will be delivered as either 8 bit or 16-bit images.
- The horizontal accuracy (RMSE) required for the orthomosaics are: 2*GSD
- Any stereo images will be delivered co-registered. Overlap between the images will be 80% forward and 70% side overlap (+-5%)
- A Digital Surface Model (DSM) that represents the height of all the surface of the landscape with a spatial resolution of at least 8cm (single band, 8-bit), to be delivered as JPEG and TIFF. This will include a set of maps and reports showing the spatial distribution of damaged and reconstructed housing units, as well as any land cover changes and topographic anomalies identified in the survey.
- A Digital Elevation Model (DEM) that represents the changes in elevation of the bald earth with a spatial resolution of at least 8cm (single band, 8-bit), to be delivered in GIS-compatible formats as JPEG and TIFF.
- Raw flight output files (e.g. .jpg, .txt, .log and/or other raw output), including 3D point cloud(s) in LAS format and flight log(s). Points will all be classified into ground/non-ground points by the vendor. The classification scheme will be agreed with WB prior to field testing.
- Data Products shall be shared both on a portable external hard drive (that is compact, compatible with USB 3.0) and through a cloud platform. The project will share a digital folder where all data (raw (jpgs and flight paths) and processed) shall be placed. The external hard drives will need to be delivered to the project in Sindh.
- Readme files that include standard metadata on each layer, including resolution, naming conventions (i.e., a data dictionary), and projection information. A UTM reference system/WG84 datum will be used for all layers.
- The project team and the vendor will agree on a digital file naming convention to be used to store the data captured during the field testing. A file structure will be agreed to for the hosting of the data, regardless of the physical medium used to store the data.

Required Skills and Experience

- Experience working in UAV and street-view imagery, land surveying, image processing, Practical experience working with geospatial imagery, preferably covering a broad range of themes including UAV and street-view image processing, land surveying, disaster management, land-use planning, infrastructure, and demography.
- Technical staff with at least 10 years of experience in UAV and street-view data collection, including in Pakistan.
- Technical knowledge and experience in UAV mapping operations, including flight planning, data collection and coordination, and image processing and analysis.
- Expertise in processing UAV imagery using pix4D and/or Photoscan.
- Knowledge and experience in urban resilience, disaster vulnerability mapping or urban planning will be an added advantage.
- Strong communications skills, with the ability to lead trainings and lead conversations with partners around technical issues.
- Understanding of major concepts and issues involved with urban planning and infrastructure.

Completion Time: Thirty (30) days