

Use of Hybrid Survey Methodology and Bhu-Sarvekshan Software for Resurvey in Bihar

The Bihar state - spread over approx. 94163 sq. Km area, has an administrative setup comprising of 9 divisions, 38 districts, 101 subdivisions, 534 circles and 45,700 mauza(s) i.e. revenue villages. The very first survey of land i.e. Cadastral Survey (CS) of the state was conducted almost a century ago. These hundred years old records have now become fragile. Their day to day handling is critical in terms of loss of information and destruction of paper based maps. Fragmentation of land parcels and their subsequent maintenance regarding updation of records were not timely accomplished. This has posed a great challenge to the government in implementing development schemes, disposal of litigations and land acquisitions for infrastructure projects.



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RE-SURVEY & CHALLENGES

A re-survey is a re-construction of land boundaries and sub-divisions accomplished by re-running, re-marking the lines represented in the field-note records or on the plot of a previous official survey.

PROPOSED SOLUTION

Department of Revenue and Land Reforms, Government of Bihar decided to start the re-survey in the state using “Hybrid Survey methodology employing Aerial Photography and Ground Truthing with TS/DGPS” (Total Station/Differential Global Positioning System) as per the guidelines of National Land Modernization Programme (NLRMP). Hybrid Survey Methodology by aerial photography and ETS (Electronic Total Station) & GPS is suggested for survey/resurvey of plain areas, where good quality Cadastral Maps are available. This technology is also appropriate for hilly areas where terrain corrected aerial photographs can be generated.

RE-SURVEY ROADMAP

For the re-survey work, ‘Bihar Special Survey and Settlement Act, 2011’ and ‘Bihar Special Survey and Settlement Niyamawali, 2012’ were enacted. The act has been designed to emphasize all the stages of Cadastral Survey and settlement operations in the state using hybrid modern methodology



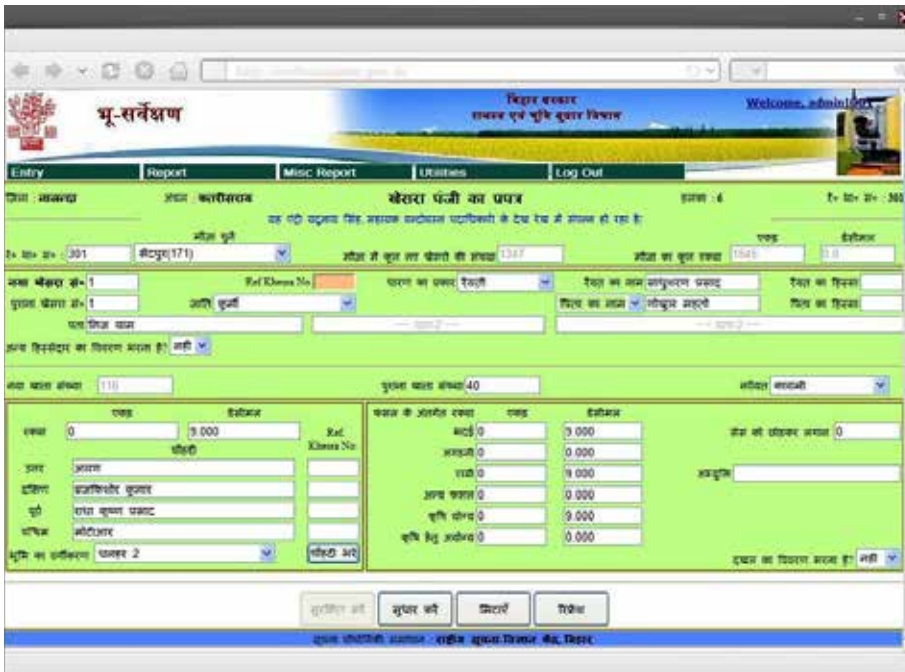
“ The basic components related to Cadastral Resurvey process are Pre-Survey Activities, Survey Activities, Post Survey Activities. Pre-Survey Activities i.e. creation of ground control network has been completed in 34 district of Bihar. Survey activities, aerial photography for 10 districts have been completed. Processing of aerial photographs and generation of ortho rectified images have been completed for 7 districts. Creation of cadastral parcel and field verification are in progress. Cadastral Maps of 2 revenue villages were finally published after completing 100% ground verification. ”

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to minimize the time span without compromising on quality, transparency and grievance redressal with lesser manpower. The re-survey was launched on 22nd May, 2013 by the then Hon’ble Chief Minister of Bihar.

RE-SURVEY EXECUTION

Re-Survey process using aerial photography started with selection of appropriate agency having expertise in Hybrid Survey Methodology. The



agency created Primary, Secondary, Tertiary and Auxiliary Ground Control Points (GCP) for the purpose.

Presently, 39 Primary and 481 Secondary Ground Control Points have been monumented in Bihar. Tertiary and Auxiliary GCPs have been monumented, which were governed by photogrammetric requirements and need based. The plot boundaries were surveyed using the offsets from the details appearing on the ortho-photo, in which case, tertiary control and auxiliary points were not needed. Flying permissions were obtained to fly over a desired area from the competent authorities like DGCA, Ministry of Home Affairs (IB) and Ministry of Defense (Military Survey).

The aircraft captures photograph of plots with specially designed camera fitted at the bottom of the fuselage. The aircraft flies on a pre-defined flight path and captures photographs with 60% forward overlap and 30% side overlap. The raw images are

stored on an onboard storage device. The camera fitted in the aircraft is GPS enabled and its IMU (Inertial Measurement Unit)/GPS data is captured separately for utilizing at the time of raw data processing. The raw data is further sent for security vetting to the Ministry of Defense. After getting clearance, the raw data

passes through different stages of processing like Aerial Triangulation, Digital Terrain Modeling, Orthorectification and Mosaicking. Aerial images have to be taken maintaining a Ground Sampling Distance (GSD) of 10 cms. Necessary pre-marking or post marking of GCPs are required for precise geo-referencing of images. It is required that each GCP is clearly identifiable in the aerial image after processing.

The generated map is sent to field for its verification through ETS/DGPS, if required. Sometimes part of image captured through aerial flying is not clearly visible because of heavy cloud, forest, orchard etc. Such uncovered area is surveyed through ETS/DGPS for modification in the map. After modification the digital map, is geo-referenced using established control survey network (Primary, Secondary and Tertiary) around existing Survey of India Permanent Reference Points. The map is indexed and meta data related to

