GNSS Supported Survey and Open Source Web GIS for Forest Inventory and Its Management

Masakuni Nakayama, Bhuwneshwar Prasad Sah, Raghunath Jha, Senthil Selvaraj (Japan) and Yakubu Mohamed (Ghana)

SUMMARY

Demand of cost effective, but precise locational survey in forestry sector is growing as issues relating to Reducing Emissions from Deforestation and Forest Degradation (REDD) in developing countries have become critical because the land use / land cover changes have significant effect on the amount of greenhouse gas (GHG) emissions. It is also a recognised cause of climate change and global warming. In order to assess the amount of GHG from forestry sector, it is essential to create well defined and easy to maintain forest inventory, preferably online, for wider accessibility and usability. Besides other, forest inventory survey mainly involves mapping of its areal extent and enumeration of predefined parameters of tree and other vegetation for a given area. Mapping is usually done using earth observation remote sensing data while enumeration of tree/other vegetation parameters is conducted by defining sampling plots. Furthermore, being geographical 3D feature, the inventory survey of forest should involve accurate locational as well as height information. In this study, Global Navigation Satellite System (GNSS) survey technology was applied to create the network of accurate and precise Ground Control Points (GCP). The GCPs were observed using dual frequency GNSS equipment and data was processed by connecting the existing national control points, which resulted into the precise and accurate location and elevation information of the observed GCPs. Sufficient number of well distributed GCPs was observed to create required density of GCPs network so that any inventory sample plot in the study area should fall within 20 km from at least one GCP. During the forest inventory survey, the nearest GCP point for given inventory sampling plot was identified and used as base station for continuously GNSS observation. Furthermore, inventory sampling plot dimension was measured using GNSS rover. The data was post processed by connecting GNSS base station and rover to obtain precise and accurate 3D locational data of sampling plots. Geographic Information System (GIS) platform enables to integrate the forest inventory plots measurement data with other relevant geospatial data, which resulted into well populated and accurate database. For the user accessibility of the database, an online Web GIS architecture was created using open source software. The low cost technology is easy to handle, manage and maintain up to date database. The database is being used for the forest resource management including GHG emission estimation. The study was carried for the Forestry Commission of Ghana.