Forest and land cover monitoring in Bangladesh

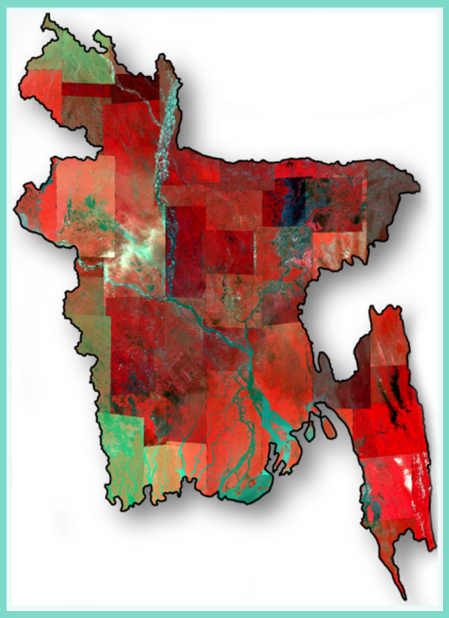
Monitoring forest and land cover change for better integrated forest and natural resources management and conservation

The growing population and economic transition significantly impact changes in land cover/use and quality of ecosystem services. Consistent, complete and comparable land cover maps over time are necessary to monitor and document these changes regularly, so that their integration in policy documents can support informed decision-making process.

Context

The land cover map 2015 of Bangladesh is the first ever harmonized map based on ISO (International Organization for Standardization) standard (ISO 19144-2) Land Cover Meta Language (LCML) developed at national scale. In Bangladesh, various agencies develop land cover maps for a range of purposes, by making use of remote sensing and ancillary data. Apart from the inherent differences in organizational objectives, dissimilarities in methodologies, boundaries, definitions, classification systems and capacities limit the utility and comparability of land cover maps across time, space, organizations and disciplines.

In response, the National Land Representation System (NLRS) of Bangladesh has been developed with contribution from several government and non-government agencies involved in land cover mapping. The system is an object-based classification system based on the ISO standard LCML. Based on this standardized classification system and analyzing high resolution SPOT 6/7 satellite images (supported by ancillary data) the land cover map 2015 is developed.



SPOT image coverage for Bangladesh

Objectives

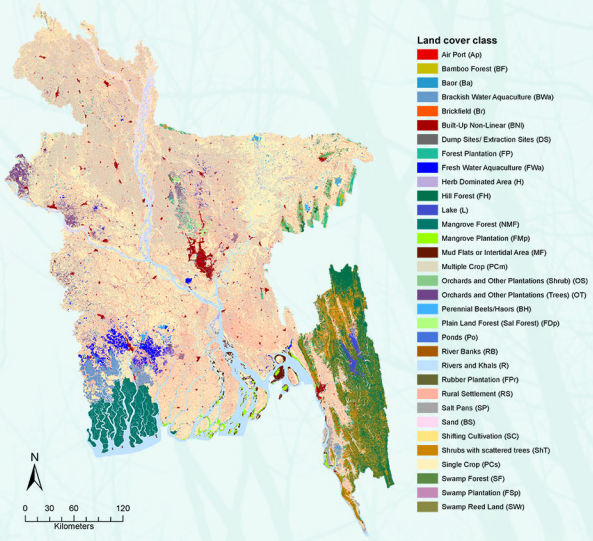
- To assess land/forest cover at national and sub-national levels to meet national and international reporting needs including sustainable development goals (SDG) indicators, forest resources assessments (FRA) 2020.
- To provide a baseline for future forest monitoring and historical assessment of land cover changes and assessing the effectiveness of forest-related climate change mitigation actions.
- To provide a robust source of information to integrate biophysical and socio-economic field information and assess the status of tree and forest ecosystem services and guide policies and measures for sustainable land management.

Process

- **Engage stakeholders:** With participation from eleven national institutions, several trainings, workshops and consultations have been conducted in various stages of land cover map development process.
- **Legend development:** The legend classes for the national land cover map 2015 have been derived from the NLRS based on the distinction of classes from satellite image interpretation, availability of ancillary data and expert knowledge.
- **Image acquisition:** Multi-spectral ortho (Level 3) SPOT6/7 images of 6-meter spatial resolution with maximum 10% cloud coverage were procured for the whole country for the year 2015. To delineate land cover classes with temporal variability (e.g., single and multiple crops) Landsat 8 and Sentinel 2 images for the same year were used.
- **Segmentation and classification:** Object-Based Image Analysis (OBIA) technique was adopted to create image objects. The image segments developed were used as the basic unit of classification and land cover code was assigned to each segment.
- **Quality Checking and accuracy assessment:** Spatial topology and attribute were checked to verify that there were no overlapping or gaps between polygons and to ensure that LCML codes in the map are consistent with the national land cover legend codes. The accuracy assessment analysis was designed using a pseudo-ground truth validation technique, with a stratified random sampling by district and by land cover class.

Results

- The overall accuracy of land cover map 2015 is approximately 90% based on expert interpretation of 14,046 locations across the country.
- Using the Land Cover Classification System (LCCS v3), NLRS based land cover legend (33 classes) has been developed.
- Training materials and proceedings have been produced and published on the e-library of the Bangladesh Forest Information System (BFIS).
- Historical land cover maps (for the years of 2000, 2005 and 2010) have been developed based on NLRS. This allows land cover change analysis for different purposes including development of REDD+ activity data.
- Land cover map 2015 is being used by various projects and purposes including
  - development of a forest baseline for REDD+
  - assessment of land degradation
  - implementation of socio-economic survey under the Bangladesh Forest Inventory (BFI)
  - integration of biophysical and socio-economic data obtained from the BFI
  - identification of land for plantation under Sustainable Forests & Livelihoods (SUFAL) project.



National land cover map 2015 of Bangladesh

Selected references

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Contact

FAO Representation in Bangladesh
House # 37; Road #08, Dhanmondi R/A;
P.O. Box 5039 (New Market), Dhaka-1205, Bangladesh.
Phone: +88 02 9126673, +88 02 8118015-8;
FAX: +88 02 58152025; E-mail: FAO-BD@fao.org

Resource Information Management System (RIMS) Unit
Forest Department/ Ban Bhaban
Plot No: E-8, B-2; Agargong, Sher-E-Bangla Nagar, Dhaka-1207,Bangladesh
Phone: 08181744
E-mail: bfis.rims.fd@gmail.com; Web: bforest.gov.bd

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