5. Conclusion

This is the first survey of its kind to measure, in a systematic way, losses and gains in forest land use between 1990 and 2005 at the global, regional, climatic domain and ecological zone levels of aggregation. The results presented in this report indicate that forest conversion to other land uses is most prevalent in the tropical climatic domain and, within this domain, in South America. Other climatic domains were remarkably stable in terms of net forest land-use change over the period 1990–2005.

The systematic survey design permitted estimates of gross forest area gains and losses and net changes in forest area, each with an estimate of precision. The exhaustive review-and-revision process by national-level forestry and remote sensing experts made possible the correction of classification errors and the identification of land uses not discernible from remotely sensed data sources alone, and provided an improved ecological context for the monitoring of forest cover and forest land-use change globally.

INTEGRATION OF COARSE RESOLUTION SATELLITE IMAGERY TO HELP CLASSIFICATION

The survey benefited from the use of global coarse spatial resolution datasets to both normalize and classify the relatively finer spatial resolution Landsat samples. Although coarse spatial resolution satellite imagery is often unsuitable as a stand-alone data source for detecting change, several studies have shown the effectiveness of using such data for the purpose of selecting training data for land-cover classifications at finer spatial resolutions. For example, Hansen *et al.* (2008) showed the utility of using coarse spatial resolution data from the MODIS VCF product to delineate potential training sites for a forest/non-forest classification in Central Africa. Similar methods have also been applied successfully in the Brazilian Legal Amazon (Broich *et al.*, 2009), Indonesia (Broich *et al.*, 2011), and the boreal region of the Russian Federation (Potapov *et al.*, 2008; Potapov, Turubanova and Hansen, 2011).

IMPORTANCE OF VISUAL REVIEW AND REVISION OF CLASSIFICATION

Visual control and correction was an important part of the land-cover and land-use classification processes and had a large impact on the final results. A comparison of the initial results from the automated land-cover classification and final reviewed-and-revised results for the tropics indicated that about 20 percent of the polygon labels were revised by national experts (Raši *et al.*, 2011). Similar results were obtained for sites in the boreal, temperate and subtropical domains (Lindquist *et al.*, submitted). The visual refinement process also had a notable effect on estimates of forest area and forest area change: for Southeast Asia, for example, the net rate of change in tree cover (loss) from 1990–2000 was assessed at 0.9 percent before and 1.6 percent after visual control (Raši *et al.*, 2011).

THE UTILITY OF LANDSAT FOR GLOBAL MONITORING

Land-cover classification and change detection methods that leverage available data from the current generation of Landsat sensors is critical for maintaining a record of land-cover changes until the new generation of sensors comes online. The Landsat programme has the longest continuous time-series of similar remotely sensed Earth observations and is a critical component in the analysis of change in land cover and land use since the 1970s. Landsat 7, the latest sensor, was launched in 1999 but suffered

a mechanical failure in May 2003 that created no-data gaps in the across-track scan line covering 23 percent of each image (Williams, Goward and Arvidson, 2006). Sampling methods, such as those described in this report, are a suitable use of the currently available Landsat image acquisitions and should be used to leverage the large amounts of information freely available in the Landsat archive (Woodcock *et al*., 2008).

ESTABLISHMENT OF GLOBAL NETWORKS

The project established two very important global networks. One was the global survey grid, which will be updated with data from 2010 as part of the next FRA (to be released in 2015). The second and perhaps more important network comprises the many national experts who participated in the survey and who remain important points of contact and sources of forest remote sensing and land-use expertise in individual countries.