Sharing data for improved forest protection and monitoring

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Although the mapping of aboveground biomass is now possible with satellite remote sensing, these maps still have to be calibrated and validated using on-site data gathered by researchers across the world. IIASA contributed to the establishment of a new global database to support Earth Observation and encourage investment in relevant field-based measurements and research.

Forest biomass is an essential indicator for monitoring the Earth's ecosystems and climate. It also provides critical input to greenhouse gas accounting, estimation of carbon losses and forest degradation, assessment of renewable energy potential, and for developing climate change mitigation policies. Although satellite remote sensing technology now allows researchers to produce extensive maps of aboveground biomass, these maps still require reliable, up-to-date, on-site data for calibration and validation. Collecting data in the field by measuring trees and documenting species is, however, a very labor intensive, expensive, and time-consuming exercise and it would therefore make sense to bring together the many extant data sets to provide real added value for a number of applications. In terms of policy applications, doing so can also lead to improved biomass products and better monitoring of forest resources, which could in turn lead to more effective forest protection measures.

In a new paper published in the journal *Scientific Data*, 143 researchers involved in this type of data collection in the field, explored whether it was possible to build a network that openly shares their data on biomass for the benefit of different communities. They particularly wanted to see if they could bring together as much on-site data on biomass as possible to prepare for new satellite missions, such as the European Space Agency's BIOMASS mission, with a view to improving the accuracy of current remote sensing based products, and developing new synergies between remote sensing and ground-based ecosystem research communities. Their efforts have resulted in the establishment of the Forest Observation System (FOS)—an international, collaborative initiative that aims to establish a global on-site forest aboveground biomass database to support Earth Observation and to encourage investment in relevant field-based measurements and research.

"Keeping in mind that this paper is a data descriptor and not a conventional paper with hypotheses, the whole idea behind this study is a new open database on biomass data. This is important for the following reasons: First, it represents a way to link the ecological/forestry and remote sensing communities. It also overcomes existing data sharing barriers, while promoting data sharing beyond small, siloed communities. Lastly, it provides recognition to the people working in the field, including those who collect the data, which is why there are 143 co authors on this paper, as they are all contributors to the database," explains study lead author Dmitry Shchepashchenko, a researcher in the IIASA Ecosystems Services and Management Program.

The researchers collected data from 1,645 permanent forest sample plots from 274 locations distributed around the globe. This data has now been made available for download via the FOS website. The initiative represents the first attempt at bringing this type of data together from different networks in a single location. The researchers point out that their work in this regard is ongoing and there are plans to continue adding more data sets and networks to the FOS. In addition to promoting data sharing, the system also promotes a new leading network on biomass data (through the FOS), which IIASA is leading and will continue to grow into the future.

Apart from the obvious benefits that data sharing hold for the scientific community, the data are also essential for training various models at IIASA such as the Bio Geo Chemistry Management Model (BGC-MAN) and the Global Forest Model (G4M). Several on-going IIASA projects, as well as other ecological, biophysical, and economic models and projects outside of IIASA will also benefit, which means that providing access to the data can improve models and understanding of biomass more generally.

"A great deal of effort has gone into collecting forest data in the past, but people working in the field (ecologists and forestry scientists) hardly ever share the collected data, or if they do, they share it only within ecological networks. The data are valuable not only for ecology, but also for remote sensing calibration and validation, in other words, to train algorithms that create biomass maps, and for assessing the accuracy of the products along with inputs to a variety of models. This piece of work represents a real step forward in sharing a very valuable biomass data set," concludes IIASA researcher Linda See, who was also a study co author.

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