Potensi dan perubahan stok karbon hutan di Daerah Aliran Sungai Batang Natal dan sekitarnya, Mandailing Natal, Sumatera Utara = Potency and change of forest carbon stock in Batang Natal Watershed and surrounding area, Mandailing Natal, North Sumatera

Hendi Sumantri, author

Abstrak

Sumber karbon utama di ekosistem hutan terdiri dari biomassa pohon, tumbuhan bawah, serasah, kayu mati dan bahan organik tanah. Karbon hutan yang tersimpan pada biomassa atas permukaan (BAP) atau aboveground biomass (AGB) merupakan sumber terbesar dan paling terkena dampak deforestasi dan degradasi hutan. Deforestasi dan degradasi hutan merupakan penyumbang kedua terbesar emisi karbon ke atmosfer yang menyebabkan perubahan iklim, setelah penggunaan bahan bakar fosil oleh industri dan transportasi.

Penelitian dilakukan dengan tujuan untuk mengkaji potensi BAP dan stok karbon berdasarkan tipe-tipe hutan, serta mengetahui pengaruh deforestasi terhadap perubahan stok karbon hutan di DAS Batang Natal dan sekitarnya, Mandailing Natal, Sumatera Utara. Pengukuran potensi biomassa pohon dilakukan dalam plot ukur berbentuk persegi panjang dengan ukuran 20 m x 125 m sebanyak 15 plot ukur. Sebanyak 8 plot dibuat di hutan lahan kering, 4 plot di hutan mangrove dan 3 plot di hutan rawa.

Total area hutan yang disurvei mencapai 3,75 ha. Pohon dengan Diameter at Breast Height (DBH) 2 cm diidentifikasi dan diukur diameternya. Penghitungan biomassa dilakukan melalui persamaan alometrik yang sudah ada untuk hutan tropis. Analisis deforestasi dilakukan melalui pendekatan penginderaan jauh. Data citra satelit Landsat tahun 2000 dan 2011 dianalisis dengan metode klasifikasi terbimbing (supervised classification) Maximum Likelihood Classifier (MLC). Analisis perubahan biomassa dan stok karbon dilakukan melalui Stock-Difference Method. Perubahan biomassa dan stok karbon total untuk setiap tipe hutan dilakukan melalui perkalian Mg ha-1 dengan luas hutan.

Hasil penelitian menunjukkan rerata biomassa pohon hutan lahan kering 364,99 ± 39,32 Mg ha-1, hutan rawa memiliki rerata biomassa pohon 643,95 ± 177,71 Mg ha-1, dan rerata biomassa pohon hutan mangrove 387,37 ± 31,10 Mg ha-1. Pada tahun 2000, DAS Batang Natal dan sekitarnya memiliki total luas tutupan hutan mencapai 93.396, dan tahun 2011 menurun dengan luas 67.961 ha. Dengan demikian, selama periode 2000-2011, luas tutupan hutan yang hilang mencapai 25.435 ha dengan rerata deforestasi 6,26% tahun-1 atau setara dengan 2.312 ha tahun-1. Rerata deforestasi hutan lahan kering mencapai 1,78% tahun-1 dengan emisi karbon sekitar 756.710 Mg CO2e tahun-1. Hutan rawa memiliki rerata deforestasi 4,48% tahun-1 dengan emisi 747.115 Mg CO2e tahun-1.

.....

The main source of biomass and carbon in the forest ecosystem are coming from trees, litter, dead wood and soil organic matter. Forest carbon stored in the above ground biomass (AGB) is the largest source; however it is also the most affected by deforestation and forest degradation. Deforestation and forest degradation is the second largest contributor of carbon emissions into the atmosphere which caused the climate change issue, after the use of fossil fuels by industry and transportation.

This research was conducted with the aim to assess the potential of AGB and carbon stocks based on forest

tipology, as well as to determine the impact of deforestation on change of forest carbon stock in Batang Natal watershed and the surrounding area, Mandailing Natal, North Sumatra. Biomass of trees measurement performed through 15 rectangular sample plots with 20 m x 125 m in size. A total of 8 plots were established in the dryland forest, 4 plots in the mangrove forest and 3 plots in the swamp forest.
The total sampled area was around 3.75 ha. All trees with Diameter at Breast Height (DBH) 2 cm were recorded and measured. In the absence of destructive sampling measurements, biomass calculated using the existing allometric equations for the tropical forest. Analysis of the deforestation was carried out using remote sensing approach. Two-dates image pair for 2000 and 2011 were classified using a supervised maximum likelihood classifier (MLC). Analysis of biomass and carbon stock changes was carried out using stock-difference method. The difference in carbon stocks is multiplied by the area of each forest type to obtain the total carbon emissions.
The results showed that average of tree biomass for dryland forest is 364.99 ± 39.32 Mg ha-1, the swamp forest has an average of around 643.95 ± 177.71 Mg ha-1, and for mangrove forests is 387.37 ± 31.10 Mg ha-1. In 2000, the total forest cover of study area reached to 93396 ha, while in 2011 the forest cover decreased to 67961 ha. Thus, during the period 2000-2011, forest cover with total 25435 ha have been converted with rate of 6.26% year-1 or equivalent to 2312 ha year-1. The deforestation rate in the dryland forest reached 1.78% year-1 with carbon emissions estimated at 756710 Mg CO2e year-1. The swamp forest deforestation rate was approximately at 4.48% year-1, equivalent to 747115 Mg CO2e year-1 of carbon emissions.