Improving the representation of soil and vegetation carbon stocks at the sub-national scale in a global land data system.

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Accurately representing historical soil and vegetation carbon stocks in land data systems is important when evaluating outcomes of land use change decisions (e.g. land use change emissions). Moreover, carbon stocks (especially soil carbon stocks) are subject to uncertainty and vary significantly based on assumptions used by different data sets. For this reason, when representing carbon stocks in data systems, it is important to present a range of values based on the distribution of carbon stock observations for a given unit (region/country/basin) at the grid cell level.

We updated the moirai land data system (LDS) to generate historical estimates of soil carbon stocks (at a depth of 0-30 cms) and vegetation carbon stocks (broken down into above ground and below ground biomass) at the sub-national (basin) level based on global fine resolution raster input data. The LDS has also been programmed to calculate soil carbon stock values based on multiple data sets (such as SoilGrids database maintained by the ISRIC and the harmonized world soil database maintained by the FAO) to enable efficient comparisons of carbon stock estimates by end users between data sets. Moreover, to account for uncertainty, carbon stocks are calculated for 6 “states” based on 5 arcmind grid cell level observations of carbon stocks (The states are -weighted average, median, minimum, maximum, quartile 1 and quartile 3). This provides a robust representation of soil and vegetation carbon stocks at the sub-national level which are differentiated by data sources and the above-mentioned states, which can be used to represent more realistic outcomes from land use change decisions. To demonstrate the utility of this data, we also implemented the same in the land module of a multi sector dynamics model, Global Change Analysis Model (GCAM) to observe the impacts on land use change decision outcomes with different initializations of carbon stock data.