



Global Development and Environment Institute  
Tufts University

## Putting “Earth” into Earth Day 2016

### Forests, Soils, Grasslands and Wetlands: Key Allies in Meeting Climate Goals

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The year 2015 has been confirmed as the hottest in the historical record. The Paris Agreement on Climate, being signed today by world leaders at UN headquarters in New York, aims to hold the global temperature increase to no more than 2°C (3.6°F), with an effort to keep it below 1.5°C (2.7°F). National commitments by 197 nations, even if fully implemented, reach only part way toward these goals. But it is now clear that just slowing or even stopping fossil fuel emissions entirely will not prevent the disruptions of global warming.<sup>1</sup> According to the IPCC, “A large fraction of anthropogenic climate change resulting from CO<sub>2</sub> emissions is irreversible on a multi-century to millennial time scale, except in the case of a large net removal of CO<sub>2</sub> from the atmosphere over a sustained period.”<sup>2</sup>

While reducing energy and industrial emissions of heat-trapping gases is essential, reducing emissions from forests, grasslands, wetlands, and soils, and enhancing their capacity to remove carbon dioxide from the atmosphere, offers a crucial pathway for success in meeting the Paris temperature goals. Soils store nearly three times as much carbon as is in the atmosphere.<sup>3</sup> The carbon released from soil degradation constitutes a major source of the carbon dioxide in the atmosphere, an amount comparable in magnitude to the contribution from deforestation.<sup>4</sup> Halting additional releases of carbon from agricultural soils would stem losses in productivity and help ensure food security. In addition, preventing releases from wetland and grassland soils and thawing permafrost would lessen the amount of human-released carbon going into the atmosphere by perhaps 20%.<sup>5,6</sup> Preventing further deforestation would reduce emissions by an additional 10%.<sup>7</sup>

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Enhancing the uptake of carbon dioxide from the atmosphere by forests, grasslands, and soils would be equivalent to reducing net emissions by an additional 30% or more.<sup>8, 9, 10, 11</sup> The Paris agreement recognizes, for the first time, the important role of Reduction in Emissions from Deforestation and Forest Degradation (REDD+) in increasing removal of carbon dioxide from the atmosphere. However, the provision only applies to tropical forests, and also needs to recognize and encourage an enhanced role for forest protection and restoration throughout the world. It is also necessary to add a role for atmospheric carbon removal by restoring carbon to all types of soils.

The French government recently launched a program to enhance agriculture by removing carbon from the atmosphere and storing it in agricultural soils. Called the "4 per 1000 Initiative: Soils for Food Security and Climate," nations and regional authorities are encouraged to increase the amount of carbon in their soil by 0.4% annually. To date, 26 countries — including Australia, Japan, and the U.K. (though not yet the U.S. or Canada) — have committed to this effort. This is the first state-sponsored program attempting to galvanize the agricultural community to embrace ecologically beneficial cropping and grazing practices expressly to enhance carbon sequestration (4p1000.org).

By replacing “Destructive Development” with “Restorative Development” practices that enhance managed and natural ecosystems while meeting human needs, a regenerative approach to forestry, farming, ranching and land use change would assure that ecosystem services are provided sustainably for the foreseeable future.

The Tufts University [Global Development and Environment Institute](#) (GDAE), in conjunction with [Soil4Climate](#), is initiating an effort to research and publicize the significant potential of natural systems to store carbon through improved restorative management. Our goal is to achieve a more prominent role for forests and soils in climate policy at the 2016 UN Climate Change Conference in Marrakesh, Morocco.

GDAE’s past [climate policy publications](#) discuss the Paris agreement including the role of forests and soils, and critique current policies on biomass policy and forests. Look for future policy briefs with more information on forests, soils, and biomass.

<sup>1</sup> Solomon, S., et al., Irreversible climate change due to carbon dioxide emissions. *Proceedings of the National Academy of Sciences* **106**(6), 1704-1709 (2009). doi:10.1073/pnas.0812721106

<sup>2</sup> Intergovernmental Panel on Climate Change. *Summary for Policymakers, in Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. 1-28 (2013).

<sup>3</sup> U.S. DOE. *Carbon Cycling and Biosequestration: Report from the March 2008 Workshop*, DOE/SC-108, U.S. Department of Energy Office of Science. (2008). <http://genomicscience.energy.gov/carboncycle/report/>

<sup>4</sup> Tubiello F.N., et al., Agriculture, Forestry and Other Land Use Emissions by Sources and Removals by Sinks: 1990-2011 Analysis. *FAO Statistics Division Working Paper Series ESS/14-02*. (2014).

<sup>5</sup> Natali, S.M., et al. Permafrost degradation stimulates carbon loss from experimentally warmed tundra. *Ecology* **95** (3): 602-608 (2014). DOI: 10.1890/13-0602.1

<sup>6</sup> Duarte, C.M., et al., The role of coastal plant communities for climate change mitigation and adaptation. *Nature Climate Change* **3**(11): 961-968 (2013).

<sup>7</sup> Houghton, R.A., et al., A role for tropical forests in stabilizing atmospheric CO<sub>2</sub>, *Nature Climate Change*, 2015. **5** (12): 1022–1023. DOI: 10.1038/nclimate2869.

<sup>8</sup> Lal, R., Sequestering carbon in soils of agro-ecosystems. *Food Policy* **36, Supplement 1** (0): S33-S39 (2011). DOI: 10.1016/j.foodpol.2010.12.001

<sup>9</sup> Magill, B., Farmland Could Help Combat Climate Change: Soils could lock up carbon, helping solve global warming. *Scientific American* (2016).

<sup>10</sup> Paustian, K., et al., Climate-smart soils. *Nature* **532**(7597): 49-57 (2016). DOI: 10.1038/nature17174

<sup>11</sup> Teague, W.R., et al., The role of ruminants in reducing agriculture's carbon footprint in North America. *Journal of Soil and Water Conservation* **71**(2): 156-164 (2016). DOI: 10.2489/jswc.71.2.156

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