

Transactional Carbon Accounting

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Accounting for the effects of anthropogenic changes in carbon flux within the earth's critical zone will be a major, fundamental challenge to address carbon-driven climate change. As a scalar path-function measure of equivalent inorganic carbon emissions, CO₂e is a necessary but insufficient metric for global carbon management. We propose a new, comprehensive strategy for fiscal accounting of anthropogenic changes in carbon flux that employs a vector, state-function, temporal metric applied to each microeconomic transaction[i], forming the basis of a transactional accounting system.

Simply stated, the proposed metric is a measure of the temporal velocity of carbon in the critical zone toward sinks such as the atmosphere and oceans, reflecting how we employ a carbon flux temporal differential to achieve a carbon-based energy differential.

This accounting methodology allows for a granular, more detailed analysis of carbon-related anthropogenic activity within a broader, more comprehensive overall framework for all such activities at all levels of the economy. In turn, the methodology promotes a more detailed macroeconomic assessment of carbon, such as in international trade flows.

A simple electrical circuit can demonstrate the vector, state-function, temporal carbon metric. The total resistance of multiple resistors in *series* is simply the sum of the individual resistors. For resistors in *parallel*, however, the total resistance is determined by adding together the inverse of the resistance, or conductance, of each of the individual parallel circuits. The inverse of the total conductance is then the total resistance of all the parallel circuits.

(insert Resistors.jpg image here)

[ii]

Electrical conductance is a simile for carbon flux in that we may add parallel carbon circuits, or flux, together to determine the total carbon flux to or from a carbon pool or sink. Until now, however, a simile for electrical resistance to describe the temporal (series) resistance of the flow (or flux) carbon toward a pool or sink has not existed.

A new term is needed to capture the conceptual inverse of carbon flux; a proposal for such a term is 'obdurance', represented by the Greek lowercase letter omicron (\omicron). As a temporal metric, the unit for obdurance is time, preferably years. Whereas electrical resistance is a measure of how much opposition there is to the passage of electrons[iii], carbon obdurance is a measure of how much temporal opposition there is to the passage of carbon atoms from one state or sink in the critical zone toward the atmosphere and oceans. A convenient way to make fractional changes in obdurance equivalent is to take the logarithm of the obdurance to convert it to a proposed new property, 'carbon quality', represented by 'cq':

carbon quality (cq) = $\log_{10}(\text{obdurance}) = \log_{10}(\omicron)$

The electrical circuit metaphor may provide further insights and tools to help apply transactional carbon accounting at each incremental step in the anthropogenic carbon cycle for managing anthropogenic carbon-driven climate change.

Application of the temporal carbon metric would result in a closer correlation between the behavior of carbon in the critical zone and the temporal consumption of carbon by the global economic engine.

[i] A transaction is a business event that has a monetary impact on an entity's financial statements and is recorded as an entry in its accounting records. Bragg, Steven. "Transaction Definition - AccountingTools." Definition - AccountingTools. AccountingTools, 2017. Web. 15 Feb. 2017.

[ii] Wikipedia contributors. "Series and parallel circuits." *Wikipedia, The Free Encyclopedia*. Wikipedia, The Free Encyclopedia, 12 Feb. 2017. Web. 15 Feb. 2017.

[iii] Parejo, Juan Carlos. "Resistance and Ohm Law." Petervaldivia. *Www.petervaldivia.com*, 2015. Web. 15 Feb. 2017.

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