CO_2 emissions and Sequestration in Suriname

Introduction

Suriname has 15.24 million hectares of forest covering approximately 93% of the country's surface area. (FAO[1], 2016). 91% of Suriname's forest area is primary forest, 8.5% is naturally regenerated and only 0.5% planted. Suriname's forests are located within the broader Guianan Moist Forests area, one of the largest continuous tracts of relatively pristine lowland tropical rainforest in the world. Suriname's population of 600,000 mainly lives on the coast, so as a result the country historically had a low rate of deforestation. Between 2004-2013, 16,000 ha of forest was harvested.

Forestry activities contributed roughly 2% to annual national GDP in 2011, while providing employment for approximately 9000 people (Global Forest Watch[2], 2015). Suriname's estimated annual deforestation rate is approximately 0.02%, with mining for bauxite, gold, and kaolin as the main driver of deforestation and degradation.

While most of the country is forest covered, the northern half of the country is where the logging concessions are located.

In the published news articles the amount of greenhouse gasses is expressed as CO2 equivalent. This needs the explained in the following note what that means[3]. The numbers that are quoted in this review refer to CO_2 only.

A **carbon dioxide equivalent** or **CO_2 equivalent**, abbreviated as **CO_2-eq** is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global-warming potential (GWP), by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming potential[4].

Carbon dioxide equivalents are commonly expressed as **million metric tonnes of carbon dioxide equivalents**, abbreviated as **MMTCDE**.

The carbon dioxide equivalent for a gas is derived by multiplying the tonnes of the gas by the associated GWP:

MMTCDE = (million metric tonnes of a gas) * (GWP of the gas).

[1] FAO Country Profiles: Suriname | Food and Agriculture Organization of the United Nations
[2] Global Deforestation Rates & Statistics by Country | Global Forest Watch (GFW)
[3] Glossary:Carbon dioxide equivalent - Statistics Explained
[4] GHGs-CO2-CO2e-and-Carbon-What-Do-These-Mean-v2.1.pdf

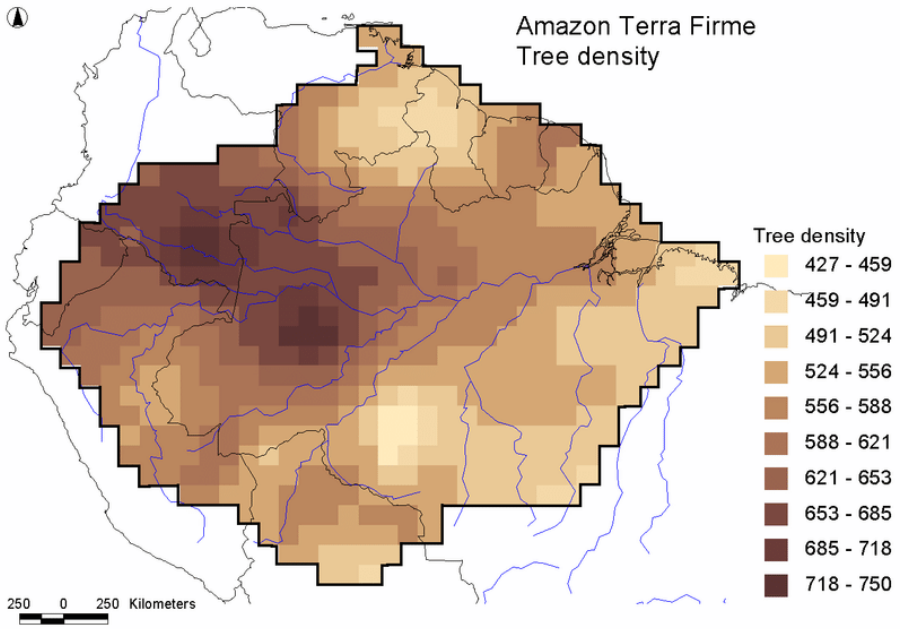
For example, the GWP for methane is 25 and for nitrous oxide 298. This means that emissions of 1 million metric tonnes of methane and nitrous oxide respectively is equivalent to emissions of 25 and 298 million metric tonnes of carbon dioxide.

Carbon Sequestration[5]

There is enough scientific evidence that the CO_2 sequestration rate of a tropical rainforest is approximately 22.6 kg/tree/yr[6]. Only trees with a trunk diameter > 100 mm are considered. A typical primary amazon forest density is typically 556-588 trees/Ha[7]; assume a value of 575 trees/Ha.

Putting it all together, $15.24 \times 10^6 \times 0.91 \times 575 \times 22.6 \times 10^{-3} = 180 \times 10^6$ tonne/yr.

Thus, we can conclude that the amount of CO_2 captured by the rainforest in Suriname will be in the order of 180 million ton. The CO_2 sequestration capability of Suriname's rain forest must be maintained or increased. Fortunately, it is possible to have a sustainable rainforest in Suriname when and regenerated.



Amazone Tree Density

[5] Carbon sequestration: how much can forestry sequester CO2?
[6] Tree-Nation-Tropical-tree-sequestration-of-CO2.pdf
[7] (PDF) A spatial model of tree alpha-diversity and tree density for the Amazon

It is important to realize that the highest CO_2 sequestration rates are achieved when a tree is growing, when carbon dioxide and water are converted to cell mass (wood). Therefore, time should be allowed for a forest to regenerate after a period of managed forestry[8].

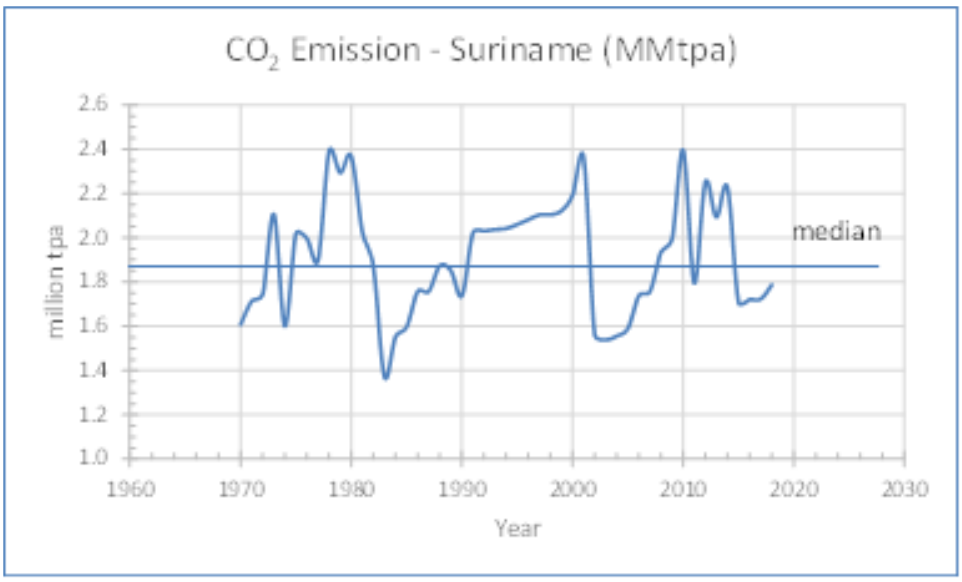
As a matter of fact, sustainable management of tropical forests can reduce carbon emissions and stabilize timber production[9]. An excellent publication from CELOS[10] about sustainable management of tropical rainforests can be downloaded online and should be reviewed.

Deforestation and forest degradation due to gold mining needs special attention and have different challenges as compared with forestry activities. While deforestation rates decline globally, they are rising in the Amazon. Artisanal-scale gold mining (ASGM) is a large cause of this deforestation and brings with it extensive environmental, social, governance, and public health impacts, including large carbon emissions and mercury pollution[11]. However, these are issues of a totally different category that require totally different solutions. The only common ground is the continuing deforestation due to ASGM activities in our forest.

CO_2 Emission in Suriname

From a database that is up to date to 2018[12] it is concluded that from 1969-2018 (50 years of data) the total CO_2 emission in Suriname varied from a low of 0.033 MMtpa to a high of 2.395 MMtpa. The median CO_2 emission in this period was 1.886 MMtpa. Of this amount of annual CO_2 emission, almost 1.83 MMtpa CO_2, or 97% is from oil related combustion (transportation, power generation, and crude oil refining).

[8] Sustainable Forestry in Tropical Forests | Global Forest Atlas
[9] Frontiers | Environmental Science
[10] Sustainable Management of Tropical Rainforests | The CELOS Management System
[11] Deforestation and Forest Degradation Due to Gold Mining in the Peruvian Amazon: A 34-Year Perspective
[12] CO_2 and Greenhouse Gas Emissions - Our World in Data



Note the drop in CO_2 emission from 2.23 million tonne in 2014 to 1.71 million tonne in 2015 when Suralco shut down operations at the Paranam refinery, which is a reduction of almost 25% of Suriname's CO_2 emission.

How much CO_2 is emitted when 1,000 Scf natural gas (CH_4) is combusted? 1,000 Scf CH_4 = 20.288 kg CH_4.

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

Hence, 1,000 Scf CH_4 emits: $20.288 \times \left(\frac{44}{16}\right) = 55.8$ kg CO_2 and therefore 300 MMScfd CH_4

$\cong \frac{300 \times 10^6}{10^3} \times \frac{55.8}{10^3} \times 365 = 6.11 \times 10^6$ tpa CO_2.

Add current 2 million tpa CO_2 and the total CO_2 emission after developing an industry that will consume 300 MMscgd natural gas will be in the order of 8 million tpa CO_2, well withing the sequestration capability of Suriname's 180 million tpa CO_2.