

Introduction

There are different criteria to allocate future emissions between countries, sometimes aiming at a just transition pathway [4]–[10]. Meanwhile, countries have also proposed their own climate mitigation ambition. In the case of Brazil, its most recent Nationally Determined Contribution committed the country to reach a 50% reduction in GHG emissions by 2030 compared to 2005 values and pledged to achieve GHG emissions neutrality by 2050. It is worth comparing this country's target with the Brazilian emission budget found according to different allocation criteria. Therefore, this study applies a global IAM to assess the challenges and opportunities of Brazil in reducing emissions and complying with its pledges.

Methodology

This study is based on the use of the COFFEE model [11]–[17] and aims to evaluate Brazil's emission pathways in a 1.5°C global warming scenario from the perspective of effort-sharing approaches proposed by van den Berg et al. (2020). Brazil's GHG emission pathways, as well as emissions allowances in the form of CO₂ budgets, are estimated for each equity criterion and compared with the cost-optimal (CO) solution of the COFFEE model considering a global remaining carbon budget of 400 GtCO₂ from 2018 to 2100, which is coherent to a global warming of 1.5°C with a 50% probability.

Results

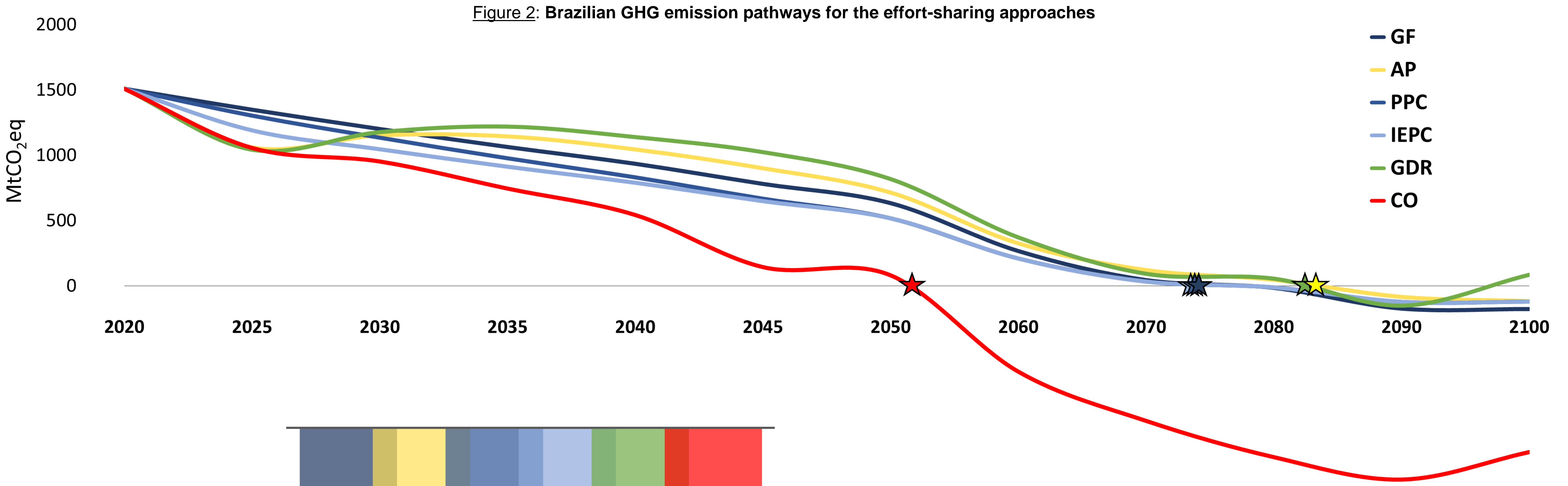
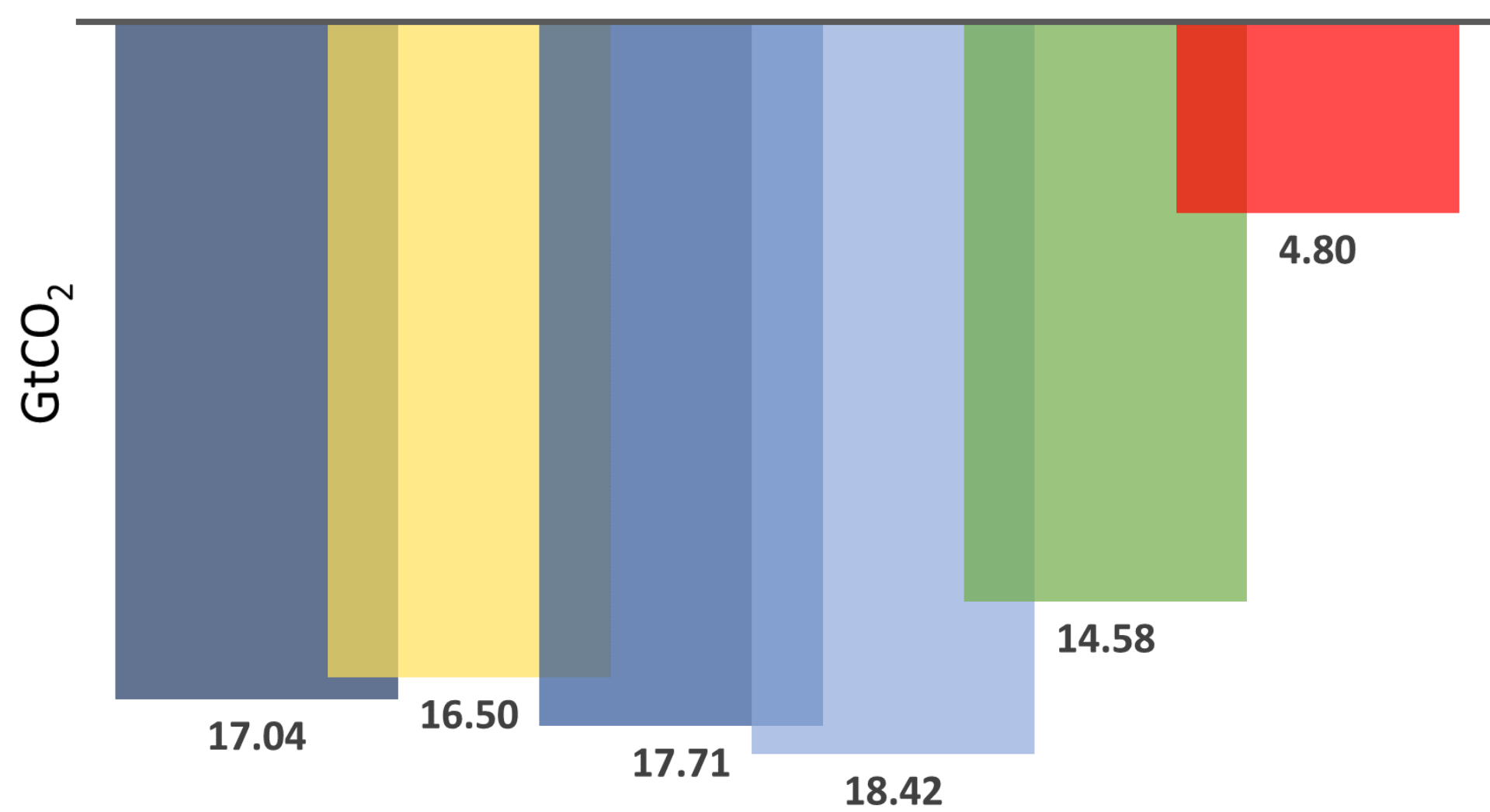


Figure 3: Brazilian remaining carbon budgets for the effort-sharing approaches (2020-2050)



- The cost-optimal solution allocates to Brazil 4.8 GtCO₂ from the remaining CO₂ budget until 2050, while the equity criteria do not differ much, allocating some 15 to 19 GtCO₂.
- The latter are very close to the cost-optimal budget for a 2°C warmer world [10], indicating that a “fair” Brazil in a 1.5°C warmer world is equivalent to a cost-optimal Brazil in a 2.0°C warmer world.

- The ambition announced by the Brazilian government at COP 26 is consistent with the cost-optimal pathway (net zero ☆ near to 2050).
- In all cases, there is a great need to reduce emissions throughout the period, particularly in the present decade (2020-2030), but with different reduction rates.
- GHG emission pathways are much less restrictive than the cost-optimal pathway defined by the COFFEE model when considering equity criteria.
- Therefore, Brazil is allowed to reach net zero GHG emissions some twenty to thirty years later than the cost-optimal pathway.
- The equity criteria show pathways with a sharp reduction in GHG emissions, which decrease by half between 2045 and 2050 compared to 2020 levels. These reductions should come mainly from the land use sector, so that the effective control of deforestation in Brazil is indispensable, since is the mitigation strategy of the lowest cost and the highest potential in the country.

Final Remarks

Effort-sharing approaches based on equity principles constrain emissions from developed countries first while developing countries undergo a slower transition. This analysis allowed us to assess how adherent is the Brazilian climate policy with the commitments assumed in its most recent NDC to achieve net-zero GHG emissions by 2050, as well as the role of Brazil in a 1.5°C warmer world.

