

## Analysis of the Relationship between Micro-Regional Human Development and Brazil's Greenhouse Gases Emission

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**Abstract :** Historically, human development has been based on economic gains associated with intensive energy activities, which often are exhaustive in the emission of Greenhouse Gases (GHGs). It requires the establishment of targets for mitigation of GHGs in order to disassociate the human development from emissions and prevent further climate change. Brazil presents itself as one of the most GHGs emitters and it is of critical importance to discuss such reductions in intra-national framework with the objective of distributional equity to explore its full mitigation potential without compromising the development of less developed societies. This research displays some incipient considerations about which Brazil's micro-regions should reduce, when the reductions should be initiated and what its magnitude should be. We started with the methodological assumption that human development and GHGs emissions arise in the future as their behavior was observed in the past. Furthermore, we assume that once a micro-region became developed, it is able to maintain gains in human development without the need of keep growing GHGs emissions rates. The human development index and the carbon dioxide equivalent emissions (CO<sub>2</sub>e) were extrapolated to the year 2050, which allowed us to calculate when the micro-regions will become developed and the mass of GHG's emitted. The results indicate that Brazil must throw 300 GT CO<sub>2</sub>e in the atmosphere between 2011 and 2050, of which only 50 GT will be issued by micro-regions before it's develop and 250 GT will be released after development. We also determined national mitigation targets and structured reduction schemes where only the developed micro-regions would be required to reduce. The micro-region of São Paulo, the most developed of the country, should be also the one that reduces emissions at most, emitting, in 2050, 90% less than the value observed in 2010. On the other hand, less developed micro-regions will be responsible for less impactful reductions, i.e. Vale do Ipanema will issue in 2050 only 10% below the value observed in 2010. Such methodological assumption would lead the country to issue, in 2050, 56.5% lower than that observed in 2010, so that the cumulative emissions between 2011 and 2050 would reduce by 130 GT CO<sub>2</sub>e over the initial projection. The fact of associating the magnitude of the reductions to the level of human development of the micro-regions encourages the adoption of policies that favor both variables as the governmental planner will have to deal with both the increasing demand for higher standards of living and with the increasing magnitude of reducing emissions. However, if economic agents do not act proactively in local and national level, the country is closer to the scenario in which emits more than the one in which mitigates emissions. The research highlighted the importance of considering the heterogeneity in determining individual mitigation targets and also ratified the theoretical and methodological feasibility to allocate larger share of contribution for those who historically emitted more. It is understood that the proposals and discussions presented should be considered in mitigation policy formulation in Brazil regardless of the adopted reduction target.

**Keywords :** greenhouse gases, human development, mitigation, intensive energy activities

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