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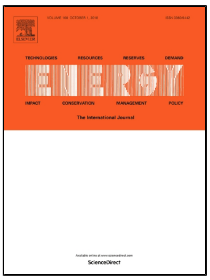

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Interactions between climate change mitigation and adaptation: The case of hydropower in Brazil

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Abstract

This paper performs a multi-model comparison to assess strategies for adaptation to climate change impacts in hydropower generation in Brazil under two Representative Concentration Pathways. The approach used allows for evaluating the interactions between climate change mitigation and adaptation strategies under low and high impact scenarios through 2050. Climate change impact projections of sixteen General Circulation Models indicate that a global high emissions trajectory scenario would likely yield more severe impacts on hydropower generation than a mitigation scenario. Adaptation modeling suggests that climate change impacts can be compensated by a wide range of alternatives, whose optimality will depend on the level of mitigation effort pursued. Our results show that climate change impacts would lead to even higher emissions in the absence of climate change mitigation policies. On the other hand, mitigation strategies to pursue lower emissions are maintained under climate change impacts, meaning that mitigation strategies are robust when faced with adaptation challenges. Mitigation efforts could yield a more diverse and less carbon intensive mix of technological options for adaptation. When analyzing investment costs to adapt to climate change impacts, in some cases mitigation can lead to a lower total investment level.

Keywords: Climate Change; Mitigation; Adaptation; Energy System Model; Hydropower; Brazil.

1. Introduction

Despite concerns about climate change and its impacts, energy system operators and planners have traditionally assumed that climate variables are stationary. Still both climate change itself as well as changes in climate variability may have serious consequences for energy production and consumption. Assessing vulnerabilities and incorporating them into long-term energy planning is, therefore, important for developing policies to cope with climate change challenges (Lucena et al., 2010a.

To this end, many studies have addressed the issue of climate change impacts on energy systems, and renewable energy in particular. Schaeffer et al. (2012) provide a review of such studies. More recently, Hamududu and Killingtveit (2012), Zhou et al. (2015), van Vliet et al.