

EGU21-15348

<https://doi.org/10.5194/egusphere-egu21-15348>

EGU General Assembly 2021

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Land-use impacts of variable renewable energy in Brazil

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Brazil has seen more than a ten-fold increase in wind power capacity in the last decade and in the past few years, the development of solar PV increased as well. However, little is known about the impacts of variable renewable generation (VRES) in Brazil compared to other world regions, although Brazilian wind power infrastructure is concentrated in the least protected ecosystems that are prone to degradation, desertification and species extinction. Even less is known about solar PV. This study focuses on land-use impacts of past VRES generation development in Brazilian federal states, which cover most of the country's VRES installed capacity. We assessed and compared their spatial installation patterns associated land-use and land cover change in the period before installation until 2019, using a detailed wind turbine and solar PV location database in combination with a high-resolution land-use and land cover map. Also, we explored which drivers contributed to the existing allocation of VRES in Brazil. We found that 62% of the studied wind park area was covered by native vegetation and coastal sands. Overall, 3.2% of the total wind park area was converted from native vegetation to anthropogenic use. Wind parks installed mainly on native vegetation, on average, underwent higher land-use change compared to other wind parks. Similar to wind power, solar PV in some regions e.g., Bahia, occupied mostly native vegetation land, however being installed in closer proximity to anthropogenic land activities than wind power.