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Impact of Climate Change on solar resource: a review of projections, uncertainties and perspectives

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The increase in global deployment of PV technology and the estimation of its continuous growth for the near future requires an accurate solar resource assessment for the industry and the different stakeholders. While historically that assessment was made with satellite or in-situ observations, studies using climate models have shown that climate projections are necessary to account for climate variability in the near or mid-future. In recent years, many studies have been conducted analyzing climate projections of solar resource, utilizing either global and/or regional climate models, considering different time horizons and emission scenarios worldwide. Some studies have used a single regional climate model for a specific area, while others have adopted a multi-model approach, incorporating simulations from coordinated experiments like Coupled Model Intercomparison Project (CMIP) for globals or Coordinated Regional Downscaling Experiment (CORDEX) for regionals. In certain cases, disparities between global and regional model projections have been identified, with corresponding analyses published.

The objective of this study is to conduct a comprehensive review of solar resource projections worldwide. The analysis will be based on six distinct regions, and the results will summarize the projected changes in solar resource and the underlying reasons. Additionally, the agreement or discrepancy between global and regional models, as well as the main sources of uncertainty reported in the literature for each region, will be examined. This work aims to synthesize the most up-to-date knowledge on solar resource assessment using climate models, in order to help the public sector and industrial experts working to incorporate climate impacts into energy sector decision-making processes around the world.