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Spatially-resolved scenarios of photovoltaic and wind power targets for accurate estimates of production

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Renewable energies, in particular wind and solar power, are part of both mitigation strategies aimed at abating climate change and sectors potentially affected by this latter. This is reflected in both the increasing commitment of countries to low carbon energies and the numerous studies devoted to investigate the potential impact of climate change on the renewable resources. However, since the former usually comes in the form of targets at the level of a region or a wider administrative area, without details on the actual locations of neither most of the current nor the future renewable units, the quantification of climate change impacts on actual renewable energy production is difficult. Hence, the objective of this contribution is to develop a model that performs a realistic spatial allocation over a provided spatial grid of given amounts of both photovoltaic (PV) and wind power either currently installed or planned to be installed in the future in a target region. We have used the 0.44º resolution grid defined for the EURO-CORDEX project and applied the model to spatially allocate total amounts of both unreported 2012 and future 2020 PV and wind power installations in Europe at the country level. Then, using the 2012 created scenarios, several options for estimating PV and wind power production as a function of weather variables and one hindcast simulation from EURO-CORDEX, the overall methodology was validated by comparing our estimated values and the annual recorded power production in the recent past. Finally, the comparison of the estimated climatological power production values under the created 2012 and 2020 scenarios revealed a non-direct relationship between increases in power installed and production, which further emphasizes the need of accurate spatially-resolved PV and wind power scenarios to perform proper estimations.