



The electricity sector susceptibility of European countries to climate change

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Due to the close relationship between electricity consumption, production and temperature, the electricity systems of countries are particularly susceptible to climate change. Based on a number of quantitative influencing factors, we provide a relative index for 21 European countries. This allows relevant stakeholders to identify the main influencing factors that determine the electricity system susceptibility of their country.

The index was determined using 14 influencing factors that include those that increase or decrease susceptibility. This includes information on monthly mean temperature, electricity consumption, import, export and production by energy source for the period 2000-2011. Moreover, we consider the results of nine global climate models regarding future temperature changes as well as data on air conditioner prevalence by country.

A quantitative relative ranked index describing the susceptibility of each country's electricity system is provided. In both Luxembourg and Greece, which top the list, the inability to meet electricity demand with inland production as well as a heavy reliance on combustible fuel electricity production explain part of the high relative susceptibility. Summer electricity consumption (another influencing factor) is expected to increase in Greece where current relatively warm temperatures, in the context of the countries included in this study, are expected to increase in the future.

Comparatively, Norway was the least susceptible country based on our index. Norway is expected to benefit from rising projected temperatures, which will decrease winter electricity consumption and limit susceptibility. Furthermore, Norway's current electricity production exceeds consumption demand and is largely based on hydro, which also decreases susceptibility.

The findings of this study enable policy makers, scientists and energy managers to examine the most important influencing factors that increase susceptibility and focus their adaptation efforts on those areas. Furthermore, the relative nature of the susceptibility index allows countries to use less susceptible country electricity systems as a guide for the transformation of the electricity system to one with a considerably lower susceptibility.