

# **Time series decomposition of the daily outdoor air temperature in Europe for long-term energy forecasting in the context of climate change**

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## **Abstract-**

Temperature is widely known as one of the most important drivers to forecast electricity and gas variables, such as the load. Because of that reason, temperature forecasting is and has been for years of great interest for energy forecasters and several approaches and methods have been published. However, these methods usually do not consider temperature trend, which causes important error increases when dealing with medium- or long-term estimations. This paper presents several temperature forecasting methods based on time series decomposition and analyzes their results and the trends of 37 different European countries, proving their annual average temperature increase and their different behaviors regarding trend and seasonal components.

**Index Terms-** temperature forecasting; time series; decomposition methods; generalized additive models; cross-validation; climate change

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## **Citation:**

*Moreno, S.; Sánchez-Úbeda, E.F.; Muñoz, A. "Time series decomposition of the daily outdoor air temperature in Europe for long-term energy forecasting in the context of climate change", Energies, vol.13, no.7, pp.1569-1-1569-28, April, 2020.*