

COMPARATIVE ANALYSIS OF SOLAR ENERGY PROGNOSIS TOOLS IN
DIVERSE CLIMATIC CONDITIONS: A CASE STUDY OF GERMANY AND
INDONESIA

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STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.



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ABSTRACT

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As renewable energy adoption grows, solar photovoltaic (PV) systems play a key role in electricity generation. However, their weather-dependent output challenges grid reliability, making accurate solar forecasting crucial, especially in regions with diverse climates. The purpose of the study is to evaluate the accuracy and reliability of prognosis models in predicting PV power output under different weather conditions. Forecast and historical meteorological data were obtained from Meteoblue and used as inputs in PVsyst simulations, which were then validated against actual power generation data from PV systems in both countries. Key performance indicators such as Mean Absolute Error (MAE) and Root Mean Square Error (RMSE) were calculated to assess forecasting precision.

Germany's forecasts were closely aligned with actual outputs, while Indonesia's results exhibited greater variability and larger error margins. The results revealed that prognosis tools perform more accurately in temperate climates, as demonstrated by the German case, which showed lower error rates across all metrics. In contrast, the tropical climate of Indonesia posed challenges for forecast reliability, primarily due to high

variability in cloud cover and the impact of urban pollution. Nonetheless, the forecast model exhibited improvement in stable tropical conditions.

This study highlights the critical importance of localized calibration and environmental factors in solar forecasting and emphasizes the need for enhanced modeling approaches in diverse climate zones.

Keywords: Solar forecasting, PVsyst, Meteoblue, photovoltaic systems, tropical climate, temperate climate, forecast error metrics





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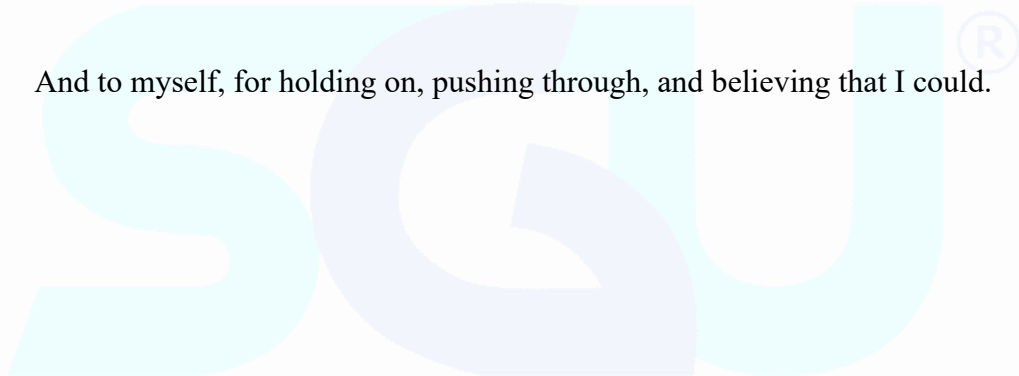
DEDICATION

This work is lovingly dedicated to Mama, Papa and Nickel, whose endless love, prayers, and sacrifices have carried me through every step of this journey.

To my dearest friends, Lina and Salma more like sisters than friends, thank you for always being there with your strength, laughter, and belief in me.

To my beloved Nyai and Engkong in heaven, I did it. I hope I made you proud.

And to myself, for holding on, pushing through, and believing that I could.



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