

In response to the growing demand for clean energy and the global shift toward sustainable development, this project presents the design, fabrication, and feasibility analysis of a Savonius vertical-axis wind turbine (VAWT), designed for the wind conditions in Nassariyah, Palestine. The turbine features an S-shaped rotor design designed using SolidWorks, with key geometric parameters—such as aspect ratio, overlap ratio, and endplate dimensions—optimized based on a comprehensive literature review.

The system was physically fabricated and field-tested, demonstrating promising performance at rotation speeds of up to 1,500 rpm under moderate wind speeds. Economically, the turbine generates an annual net return of NIS 4,884, with a payback period of only 2.6 years, resulting in a net profit of NIS 84,680 over a 20-year lifespan.

This study highlights the feasibility of small-scale wind energy systems in rural Palestinian areas, offering a cost-effective and environmentally friendly solution to the region's energy challenges.