

Feasibility of Wind Power in Kenya's Tea-Growing Regions

Erik Nordman, Ph.D.

Kenyatta University

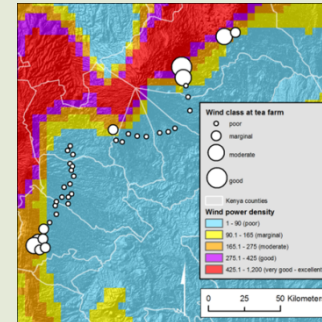
Grand Valley State University



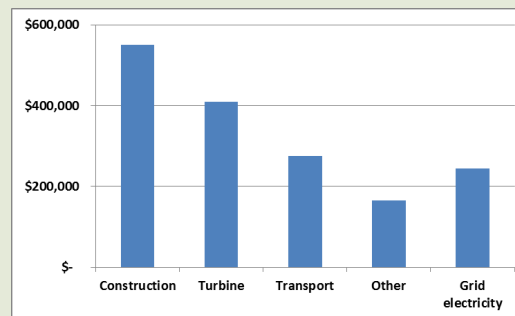
Clean, affordable energy systems could transform Kenya's tea-growing regions.



Energy and the tea sector

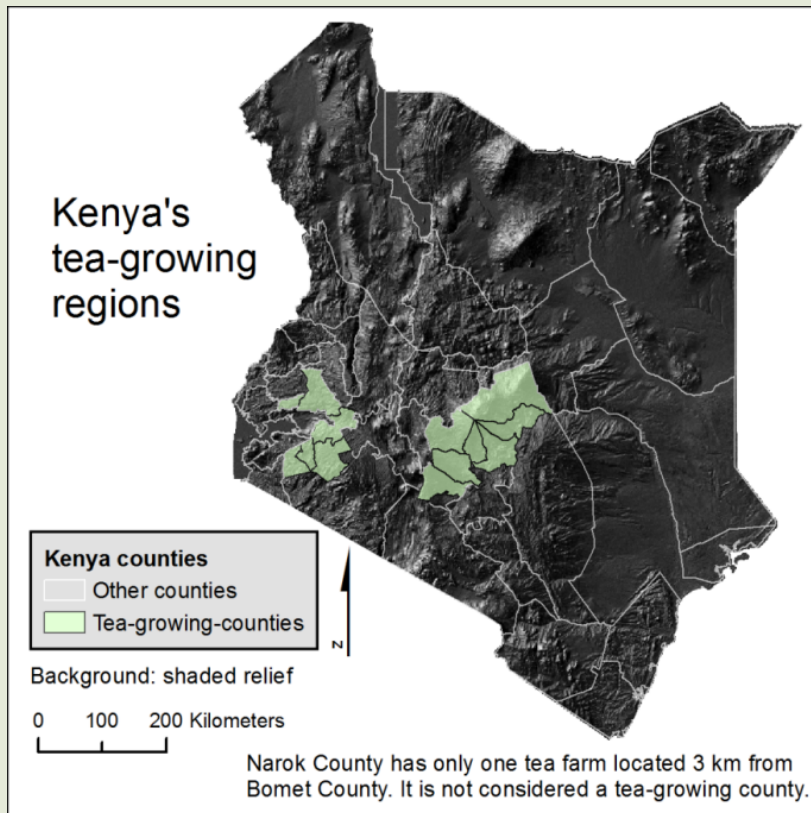


The SWERA dataset



Economic analysis

Energy is essential for tea production, but access to modern sources remains limited.



Poverty rates in tea regions: 24-64%

Energy access: 16%



Grid electricity is expensive: 17% of production costs

Frequent outages

Enhancing rural electricity grid can alleviate energy poverty and increase grid reliability.



Cost-effective generation lowers production costs, increases profits



Grid improvements benefit everyone and complement off-grid solutions

Above: ReadySet charger



KTDA's cooperative structure provides institutional and physical infrastructure

KTDA: Kenya Tea Development Agency



Is wind energy a feasible energy choice for tea-growing regions?

Wind's potential contribution was assessed using the Solar and Wind Energy Resource Assessment.



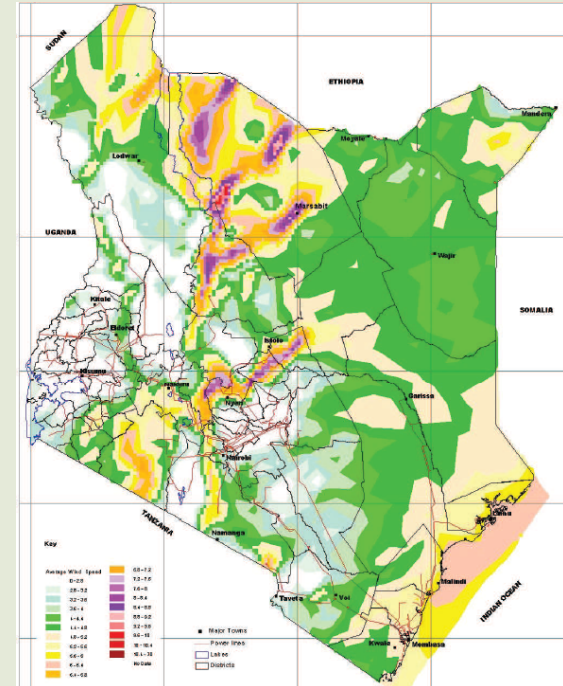
UN Environment Programme

Data available for select countries, regions, and the world.

Coarse scale suitable for broad pre-feasibility assessments

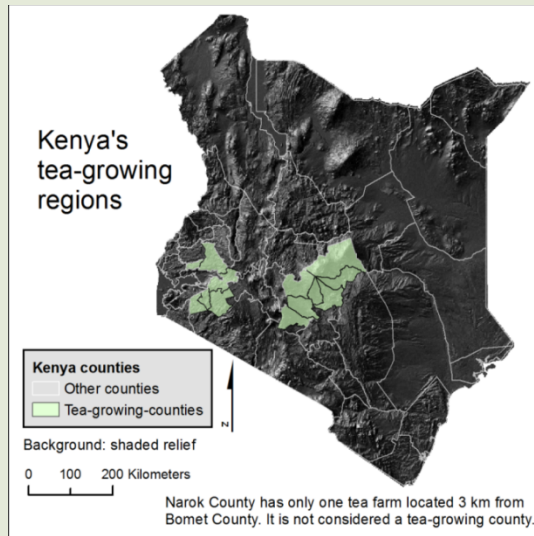
Kenya data available on 5 km grid

<http://en.openei.org/apps/SWERA/>

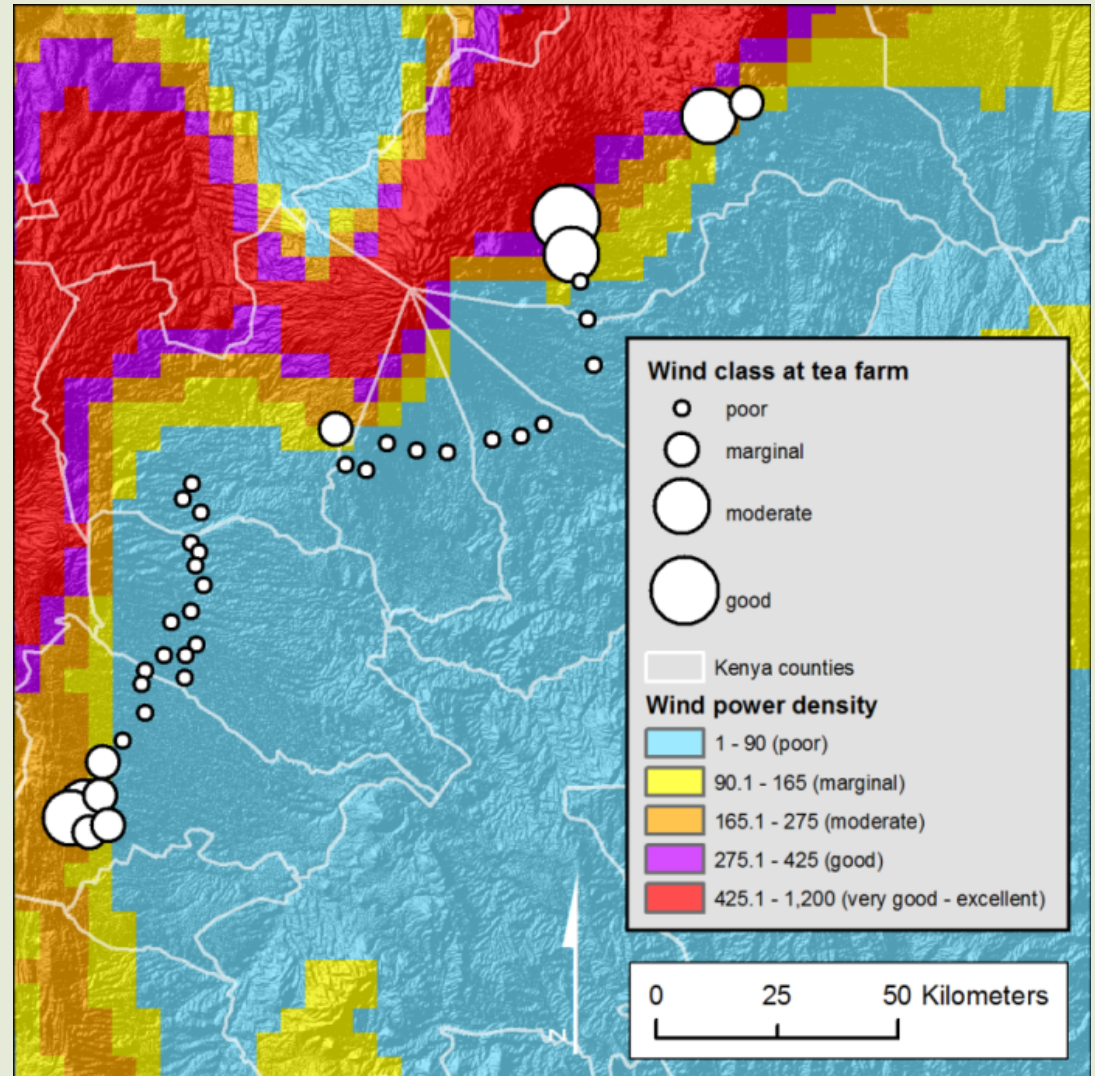


SWERA Kenya Country Report

Five of 39 tea farms in the Mt. Kenya region have Class 3 or 4 winds.



Wind speeds were lower in the western region.



The capital cost of the Goldwind S48 750 kW turbine was \$1.5 million, or \$1,984 / kW



Key assumptions:

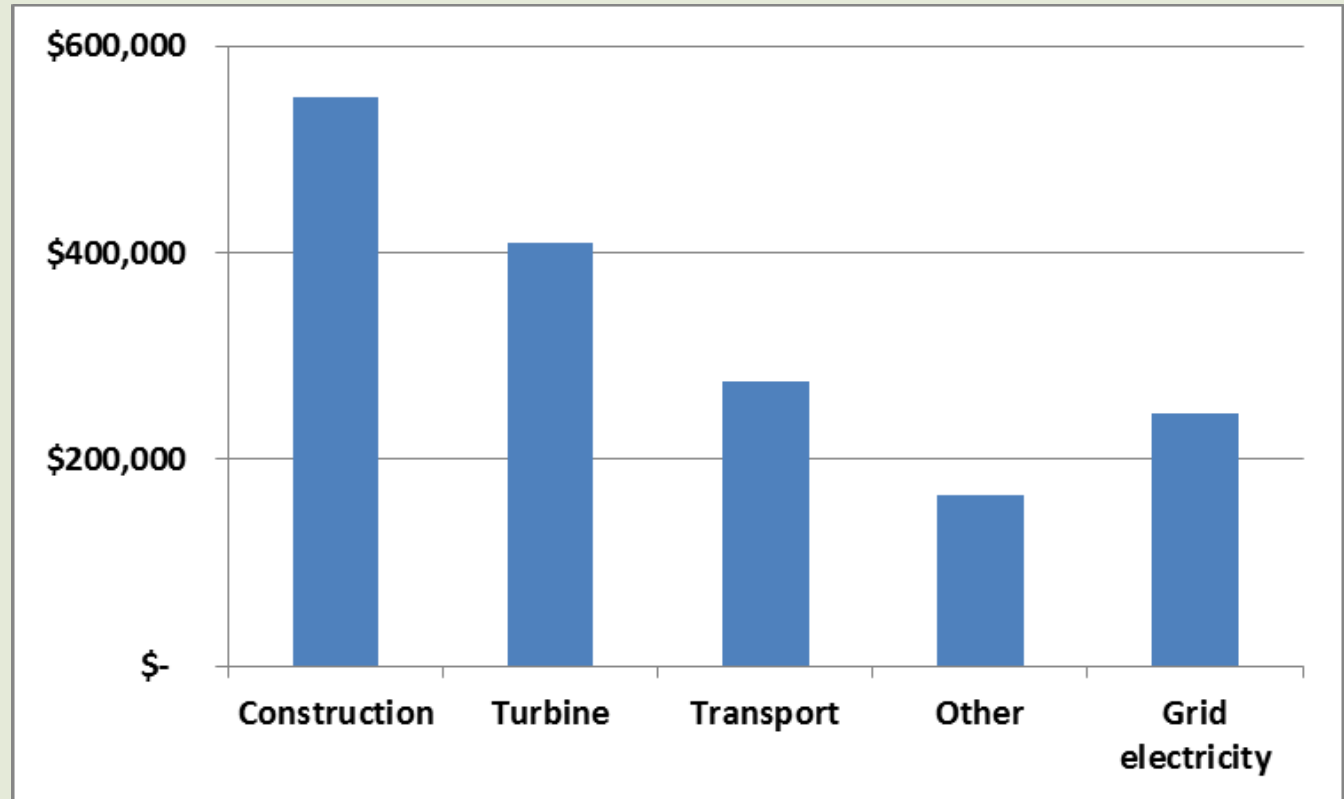
20 year life

10% discount rate

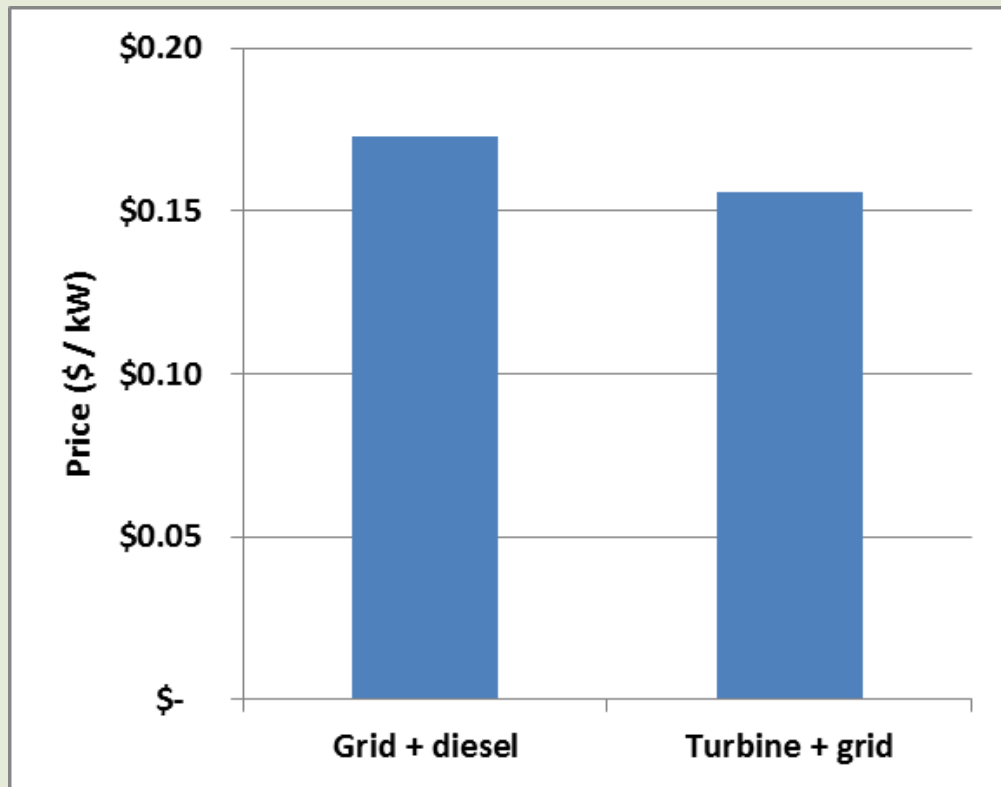
5% inflation rate

5% fuel escalation

rate



The best wind areas had a positive NPV and a LCOE less than grid + diesel backup.



NPV = \$515,000

Annual savings: \$60,000

No subsidies or carbon credits

Analysis was most sensitive to:



Wind speed

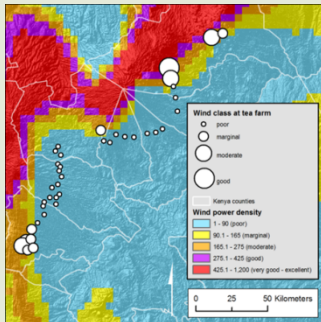


Electricity price

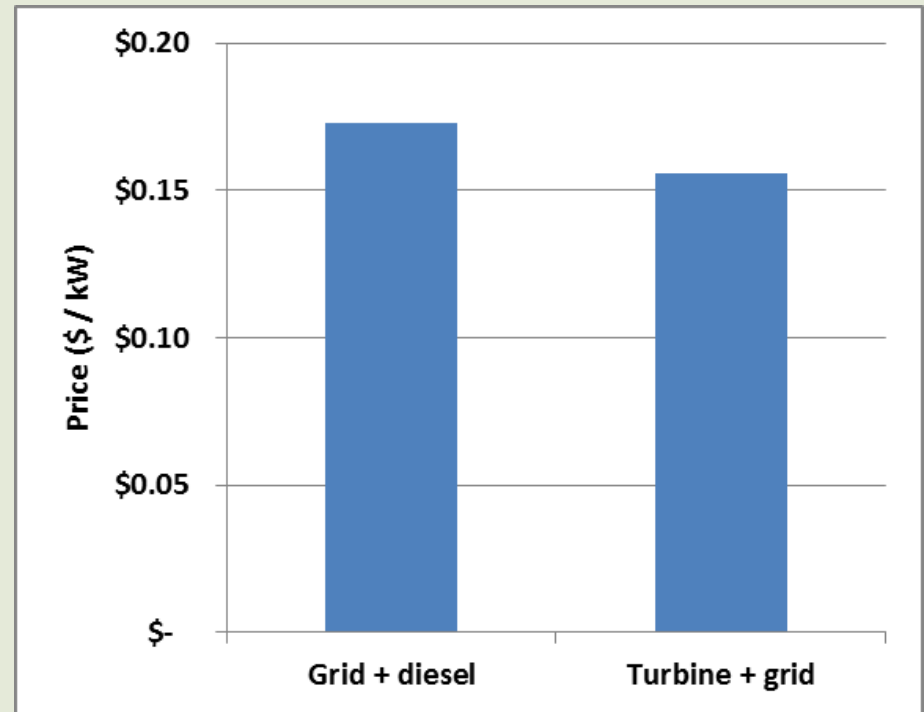
Wind energy is a feasible energy choice in some locations near Mt. Kenya



Energy and the tea sector



The SWERA dataset



Economic analysis