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Tool-based renewable energy system planning using survey data: A case study in rural Vietnam

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Abstract
Renewable energies provide effective sustainable development by raising living standards, accelerating economic growth, and mitigating pollution. However, specifically in developing countries, the lack of information, data, and local expertise challenges the design process and long-term success of renewable energy systems. Following the call for inter-disciplinary, solution-oriented research, this work uses a design science research-approach to facilitate multi-energy planning. The decision support system NESSI4D is developed, which considers site-specific economic, environmental, technological, and social factors and is tuned for stakeholder needs in developing countries. Following a step-by-step process model manual, the artifact's applicability is demonstrated in a use case for a rural community in Thua Thien-Hue, Vietnam. Missing load data are synthesized from the TVSEP with the software RAMP. The results show that the implementation of renewable energy technologies only enables affordable, low-emission electrification with governmental financial incentives. Several sensitivity tests illustrate the impact of changing assumptions and highlight the importance of detailed analyses with highly specialized tools. The demonstrating use case validates the method's relevance for research and practice towards the goals of effective sustainable development.

Keywords Sustainable development goals · Decision support system · Renewable energy systems · Design science research · Vietnam · Load profile

List of symbols

Units

a	Year
%	Percentage
W	Watt

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