Workshop in Sokoine University of Agriculture, Edward Moringe Campus, Morogoro

Dr Peter Deeney, UCC & Prof Jeremia Makindara, SUA

Monday 2nd September 2024

Funded by: SFI Future Innovator Prize – Workshop Grants 24/FIP/WG/3632

Meeting in
Sokoine University of Agriculture,
Mizengo Pinda Campus, Katavi

Dr Peter Deeney, UCC & Prof Jeremia Makindara, SUA

Wednesday 4th September 2024

Funded by: SFI Future Innovator Prize – Workshop Grants 24/FIP/WG/3632

Project Team

Ireland

Team Lead

- Dr Peter Deeney
- University College Cork

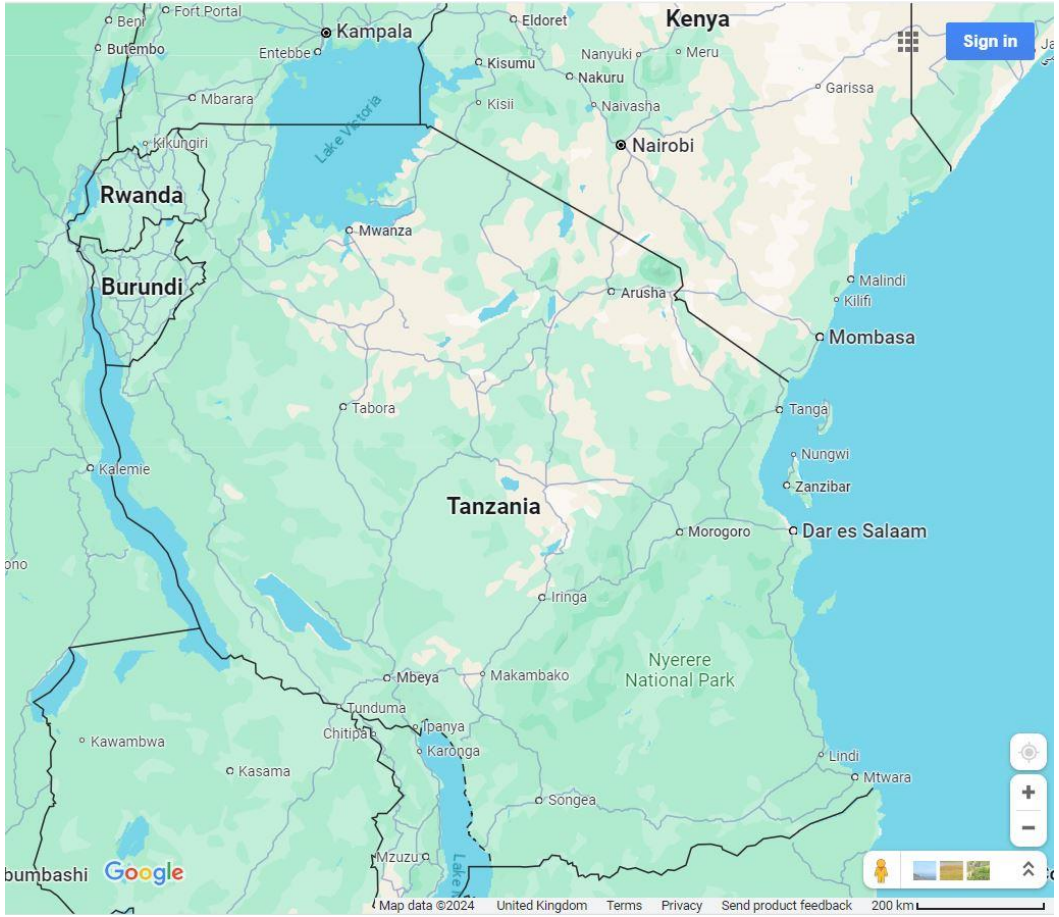
Tanzania

Partner Country Co-Lead

- Prof Jeremia Makindara
- Sokoine University of Agriculture

Introduction to Ireland

Ireland and Tanzania on the same scale



Populations: 5.3m; 65.5m

Areas: 53k km^2; 947k km^2

University College Cork

- One of the seven universities and four technical universities in Ireland
- Very good at attracting research funding, €123 million in 2022/3

- The Environmental Research Institute looks at renewable energy, air quality, water quality, impact on society and other aspects of environmental research.

Peter Deeney

Personal Website

http://peterdeeney.com/

Wind Value Research Site

https://windvalue.ie/

Wind Value's first published paper

Routledge

OPEN ACCESS

The financial risks from wind turbine failures: a value at risk approach

I. Introduction

There is a global effort to decarbonise power generation by using renewable energy in response to climate change (Balsalobre-Lorente et al. 2023), with wind energy becoming increasingly popular. Increased wind capacity lowers the mean and variance of production costs (Lynch and Curtis 2016), strengthening financial resilience and market stability. However, wind farms face significant risks from turbine component failures. Initially, wind energy profitability relied on government subsidies, but as the industry moves towards full commercialization, understanding failure risks' impact on profitability is crucial, especially for new investors and community-based projects with smaller turbines which may not purchase a long-term guarantee from the manufacturer (Leaney et al. 2001). This paper aims to highlight the financial impact of failure risks, offering valuable insights for investors, insurers, and industry practitioners by developing a method to estimate and quantify these risks using investment finance measures.

The Chartered Institute of Management Accounts defines operational risks as those arising from an entity's structure, systems, people, products, or processes (Collier 2006). In manufacturing, these risks involve physical asset damage, system failures, and employee safety. Financial losses from wind turbine failures include energy sales loss (opportunity cost) and replacement equipment costs (direct cost) (Berger 2004). This study focuses on uncertainty in random failures that can cause significant financial losses. High-risk projects, like small-scale community projects, often struggle to secure institutional finance, hindering renewable energy investment growth (Gatzert 2016).

According to Modern Portfolio Theory, investors can reduce overall portfolio risk by diversifying their investments across uncorrelated assets (Mangram 2013). In the wind energy industry, this means having multiple turbines in a farm to ensure continued power generation if one turbine fails. Turbines operate independently, so a failure in one, such as from a lightning strike, does not affect others. This is the same for failures of components such as generators, blades, and gearboxes. Financial theory uses measures like standard

Mikindani, D., O'Brien, J., Leahy, P.G. and Deeney. P. (2024) The financial risks from wind turbine failures: a value at risk approach , Applied Economics. pp. 1–16. doi: 10.1080/00036846.2024.2380542, is now published. It deals with the risks from equipment failure for wind farms, in particular it looks at the measurable advantages of diversification. Download the paper here. July 2024

Purpose of the Project – from Call Document

- Advancing sustainable, resilient, equitable and healthy food systems;
- Strengthening the use of technology (including digital) and data in food systems transformations, with particular consideration of gender-responsive interventions;
- Encouraging nutrition-sensitive agriculture interventions that advance nutritionally rich foods and dietary diversity, and that recognise the importance of genetic diversity in food production;
- Fostering climate resilient and nature-positive production systems;
- Harnessing the role of blue foods (lakes and sea) for sustainable, resilient, equitable and healthy food systems.

Current Project Title:

Assessing the priorities, scale and implications for irrigation using renewable energy in (off-grid) rural Tanzania

Questions:

- Does this title represent the aims of the workshop participants?
- What other benefits can come from renewable energy in rural Tanzania, in addition to irrigation?
- How else can renewable energy increase crop yields and farm incomes?
- Suggestions welcome

WORKSHOP PLAN/GUIDE:

- ISSUES RELATED TO CLIMATE CHANGE AND IRRIGATION IN TANZANIA AND IN TANZANIA/KATAVI – TZ/SUA RESEARCHERS EXPEREINCE.
- ISSUES RELATED TO RENEWABLE ENERGY IN COMMUNITY SETTINGS - UCC RESEARCHERS EXPEREINCE.
- STATUS OF IRRIGATIONS STEMS/SCHEMES IN TANZANIA AND THEIR ENERGY SOURCES AND REQUIREMENTS - SUA RESEARCHERS.
- STATUS OF RENEWABLE ENERGY IN TANZANIA/KATAVI – SUA RESEARCHERS
- FINANCIAL IMPLICATIONS OF HIGHER YIELDS AND INVESTMENT COSTS ON THE ECONOMIC WELL BEING OF FOOD PRODUCERS - UCC RESEARCHERS.
- SHARING OF INSIGHTS FROM THE CURRENT COMMUNITY ENERGY RESEARCH CARRIED OUT BY DR. NIALL DUNPHY'S CLEANER PRODUCTIION PROMOTION UNIT – UCC RESEARCHERS.

Economic Advantages

- No need to buy diesel/kerosene for generators
- Ability to operate water pumps in a highly controlled manner
- Food processing at the farm, increasing the value of produce
- Access to electricity for small power uses (lights, phones)
- Combination of wind and solar gives much improved coverage
- Makes local farming more attractive and encourages people to stay in food producing areas.

Community Attitudes about Wind Energy

- Based on focus groups in Islay, Scotland and Donegal, Ireland:

- Work done by X-Rotor (European Funded)
  https://zenodo.org/records/6973958

- Wind Value (Irish Funded)

  https://windvalue.ie/wp-content/uploads/2023/12/Donegal_Community_Engagement_Report_Zenodo.pdf

Community Energy in Islay, Scotland

- Small community energy project on Islay, an island off the west coast of Scotland.
- Islay Energy Trust: https://www.islayenergytrust.org.uk/
- Single horizontal axis wind turbine owned by the local people
- Sells electricity to the grid
- Shares the profits within the community
- Extensive discussion among the community led to no planning objections.

Community Attitudes to Wind Energy
(focus groups)

- Energy freedom, pride, satisfaction from PV owners
- Energy Reliability – especially on islands and rural areas
- Job opportunities
- Encouraging new local industries which need electricity (ice)
- Need for community-based governance
- Sell to the grid or sell directly?

X-Rotor Questionnaire

Table 2: Group 1 Agreement Scores for Topics

Climate Change Awareness	Agreement Level
Climate Change is a Serious Problem	1.18
Ireland needs more electricity	1.19
I use more energy now than 10 yrs ago	0.61
Energy for heat is too expensive	1.16
Fuel for transport is too expensive	1.46
Electricity is too expensive	1.16
Global Warming is a hoax	-1.14
Wind energy is too unreliable	-0.65

Attitude Towards Offshore Wind	Agreement Level
Offshore Wind Farms are Good	0.91
Serious problem for Fishing	-0.09
Damage to Leisure and Tourism	-0.68
Wildlife is Disturbed	-0.07
Jobs for people on the coast	0.68
Kills Seabirds	-0.11
Produces Cheap Electricity	0.58
Wind Turbines are Noisy	-0.39

Call Document – Objectives (6/36)

- **3 Objectives of the SDG Challenge**
- The overarching purpose of the SDG Challenge is to develop transformative, sustainable solutions that will contribute to addressing development challenges under the UN SDGs in Irish Aid's partner countries.
- The objectives of the SDG Challenge are:
- To generate impact through advancement of sustainable solutions in addressing global sustainability issues and the UN Sustainable Development Goals (SDGs);
- To support the mobilisation of transdisciplinary teams, comprising academic researchers and societal stakeholders to identify key development challenges where sustainable solutions can deliver transformative impact with a focus on southern partner countries;
- To enable the development of collaborations between researchers in Ireland and researchers in partner countries where Irish Aid works;
- To support development, deployment and demonstration of sustainable solutions across a range of application areas.

Three Phases of the Funding Application

- Page 13 of the call document says “approximately five… enter Concept Phase”

Figure 2. Phase structure of the SFI Future Innovator Prize. Numbers of teams and award sizes are indicative and may differ depending on the specific challenge call and outcome of the review process.

Application Content p.12 (15/36)

- **Team**: Applicants should provide a clear description on how, through its composition, complementarity and formation, the team brings a unique perspective in addressing this problem. Applicants are advised not to provide biographies of team members rather to convey the team's ambition and its ability to deliver. Information on the team will be complemented by the curricula vitae submitted as part of the application.
- **Challenge/Problem**: Applicants should describe clearly the specific challenge/problem that will be addressed, articulate their understanding of it and identify key issues or barriers in addressing this problem. This should include consideration of the specific context of this challenge in the partner country. As part of this description, insights from engaging with stakeholders/beneficiaries and how this has validated the problem should be included. Applicants may also include information on the wider relevance of the proposed challenge/problem beyond the partner country.
- **Solution**: Applicants should clearly describe the solution proposed. This should include a description of how the proposed solution is novel and/or unconventional in its approach, what is its current stage of technical development, what is the current state-of-the-art and how will the proposed approach overcome current barriers. Applicants should include consideration of ethical or regulatory issues where relevant. Evidence that the solution is feasible/viable associated risks should be provided. Applicants may consider providing a number of high-level milestones/deliverables (and achievement times).
- **Societal Impact**: Applicants should outline the societal impact that their proposed solution can achieve in the partner country and more broadly. Applicants should outline outcomes their solution is expected to deliver, as well as timeframe for delivery.

Criteria p.17 (20/36)

- **Quality, experience and ambition of the applicant team** – Consideration will be given to the team's ambition, complementarity of expertise, the appropriateness of its composition for addressing the proposed challenge and that necessary partnerships/collaborations are in place to deliver the proposed impact. Consideration will also be given to the quality, significance and relevance of the individual team members' track record and key achievements as demonstrated in the CVs under the following headings: 1) Generation of Knowledge, 2) Development of Individuals and Collaboration, 3) Supporting Broader Society & the Economy and, 4) Supporting the Research Community.42 The review will make note of individuals' career stages and research disciplines, taking into account any periods of leave.
- **Understanding of the challenge/problem** – Consideration will be given to recognition and understanding of the significance of the problem identified. Stakeholder/beneficiary engagement undertaken in validation of the problem will also be taken into account.
- **Novelty of the proposed solution, including its potential to deliver disruptive innovation** – Consideration will be given to the innovation potential of the overall proposed solution, including the novelty of the proposed solution, comprehension of the current state of the art, value for money, the sex and gender dimension etc. Note that novelty may arise through combination, convergence, application or repurposing of technologies in a new or unforeseen way.
- **Transformative societal impact potential of the solution** – Consideration will be given to the potential for the solution to create significant beneficial societal change or impact. Stakeholder/beneficiary engagement undertaken in validation of the solution will also be taken into account.
- **Feasibility of execution within the budget and timeframe permitted** – Consideration will be given to the feasibility of delivering the project within the budget and timeframe of the Concept and Seed Phases and likelihood that this can lead to successful delivery of the solution during the Prize Award Phase.

Partner Country Costs p.21 (24/36)

- In the Concept Phase of the award, a maximum of €23k (of the total €50k) may be allocated to the Partner Country Team Co-Lead.
- In the Seed Phase of the award, a maximum of €115k (of the total €250k) may be allocated to the Partner Country Team Co-Lead.
- Eligible costs for the Partner Country Team Co-Lead are the same as those in the SFI Grant Budget Policy. However, local institutional salary scales should be used for research team members (e.g., postdoctoral research assistants, research assistants) funded under this award and should be indicated in the budget justification. Subject to appropriate justification, a contribution of up to 50% of salary costs for the Partner Country Team Co-Lead may be requested. The requested level should be commensurate with the time commitment to the project and the salary scale should be indicated in the budget justification.
- For each line-item, please indicate clearly if this to be allocated to the Partner Country Team Co-Lead.
- In addition to direct costs, SFI also makes an indirect or overhead contribution to the host research body, which is reflected as a percentage (30%) of the direct costs (excluding equipment).

Thank you for your Attention

- peter.deeney@ucc.ie
- makj@sua.ac.tz

- *This workshop was conducted with the financial support of Research Ireland (formerly Science Foundation Ireland) and the Department of Foreign Affairs (DFA) under the SFI Future Innovator Prize - Workshop Grant 24/FIP/WG/3632*

Irish Aid
An Roinn Gnóthaí Eachtracha
Department of Foreign Affairs

Taighde Éireann
Research Ireland