

4TU Alliance on Energy Access

Introduction

The four technical universities of the Netherlands all have researchers working on the energy access goals of the first target of SDG7: *By 2030, ensure universal access to affordable, reliable, and modern energy services.*

Despite significant progress towards SDG7 over the past decade, over 700 million people lack access to electricity and nearly 2.5 billion people do not have access to clean cooking. Moreover, based on current trend, nearly 10 percent of the world population will lack access to electricity access and nearly 30 percent to clean cooking by 2030.¹ ⁱⁱⁱⁱⁱThis is pertinent to mitigating greenhouse gas emissions and adapting to climate change.

Among the key issues involved is a fragmented approach to addressing energy access where learnings from technological advancements, user-centric design, sustainable business models, and policy innovations are not shared nor combined in a holistic manner. Although academia can play a key role here, energy access topics in LMICs contexts are relatively underrepresented at each of the universities and in academia in general. We believe that joining forces at the four technical universities each with its own unique strengths will bring research and education pertaining to low resources settings to a next level.

We therefore build a 4TU Alliance on Energy Access in LMICs as a platform for researchers to join forces and share insights, their findings and streamline the research capacity for SDG7 and to connect with the Dutch energy access sector. This aims at supporting and coordinating research and educational activities with impact on one hand and have strong collaboration with the Dutch energy access sector on the other, creating a two-way feedback loop.

Vision for Energy Access

The central goal of the alliance is to enhance the involvement of technical universities in the field of energy access and thereby to join the Dutch effort for a just and sustainable energy transition worldwide. We aspire, thereby, to contribute our part to more reflexive and science-based interventions to facilitate environmentally and socially responsible solutions.

As an academic partner for this sector, we envision to guide and support the Dutch effort to tackle the lack of access to (sustainable) energy worldwide by drawing on the academic strengths. We believe that academic work offers the opportunity to include multiple disciplines, methods, and data to make sure that the research is well balanced which helps to advance a broader societal benefit. This characteristic of academia is a valuable vehicle to accelerate and ensure a systemic green energy transition with a long-term vision. One that is feasible and workable for the local context and sustainable for people and planet.

Drawing on the abovementioned strengths of academia, the alliance will provide insights and methods to advance the energy access discourse and practices of Dutch organizations who are part of the Compact

and beyond to tackle the challenges of SDG7. Furthermore, we will work towards providing knowledge for policy making in this field for both the short-term in 2030 and the long-term moving towards 2050.

Mission

The work of the alliance is founded on the three pillars of research, education, and social impact. For academics, the pillars of research and education are the main tools used to valorize the work of a university. Collaboration models that allow for more targeted research and educational activities addressing energy access challenges will therefore be leveraged to set-up partnerships aligned with our vision, to combine them with activities that result in local job creation, capacity building and knowledge exchange. Co-creation and collaboration with both local stakeholders and working in this field is therefore key to reaching greater societal impact.

Long-term actions are rooted in a strategic approach with the goal of contributing to local capacity building and knowledge exchange. We underscore this mission in the 6 position statements in the next paragraph.

Values and positions

1. We are a global player in SDG7

- We take an active role in contributing to achieving SDG 7, particularly Target 7.1: Ensuring universal access to affordable, reliable, and modern energy services by 2030.

2. We promote innovations for improved quality of life

- We develop technology as well as nontechnical (e.g., business, design, and policy) solutions to address energy access challenges in LMICs.
- At the same time, we view technology and innovation as tools utilized for improving access to energy in LMICs. The main goal is to work towards the productive use of energy and empowering end-users to improve livelihoods and economies with respect for the local environment.

3. We promote a systemic approach

- We believe that an academic approach brings a long-term vision, explores new frontiers, and offers systemic perspectives on transition processes, and critical perspectives on sustainability trade-offs. As an academic partner for this sector, we envision to guide and support the Dutch effort to tackle the lack of access to (sustainable) energy worldwide by drawing on the academic strengths.

4. We collaborate with local partners

- Local ownership and agency by the local citizens are crucial aspirations by which the Alliance will evaluate the projects to engage with. Building local infrastructures, local production, maintenance and repair capacities, and local expertise for realizing technological, business model, and policy adaptations in line with local conditions and requirements are evident needs to reduce geo-dependency and ensure local ownership.
- Partnerships are founded on principles of inclusivity, equality, and mutual respect for each respective culture. A successful project is one that is co-created with local partners based on these principles to ensure trans-disciplinarity, societal relevance, just processes and outcomes, and long-term value of the projects.

5. We apply transdisciplinary approaches

- We value approaches that lead to structural and long-term benefits by involving various stakeholders to ensure an in-depth understanding of the problem and feasible alternatives in the local context.
- Attention to context-specificity is an additional principle that will be used to ensure that the local culture and specific conditions are considered and respected. We endeavor to disentangle locally

specific issues affecting project outcomes from more widely generalizable patterns, in order to extract lessons for designing decision tools for policy makers, entrepreneurs and other practitioners.

6. We share and exchange knowledge

- Research and education are our core competencies which cover diverse academic disciplines and interests.
- Education is leveraged as a tool to perform knowledge exchange and capacity building on the ground, for instance through challenge-based learning (CBL) projects.
- Education is additionally utilized to educate more students from high-income nations in energy access topics and raise their awareness about the complexity of innovation in low resource settings and educate them on how to navigate this complexity as socially responsible engineers.

7. We advise policymakers

- We support the decision-makers to design policies that are in line with global goals and local needs.
- Female empowerment is an important value the 4TU upholds and ensures in the identification, design and implementation of the projects.
- Circularity is an integral aspect of projects to ensure minimal environmental impact.

Objectives

The aforementioned values and positions guide the design of our academic tools. As technical universities we draw on our expertise in technology, innovation, and education which serve as our tools that we use to materialize our values and positions. To do so we define the following outputs until 2030:

- 1 jointly developed centralized course or program on sustainable development and energy access in LMICs
- 1 jointly developed MOOC
- At least 7 SDG7 related research articles
- At least 7 joint research articles with local universities in the Global South
- Integrated case-studies in the existing courses under supervision of the 4TU team
- 1 full professor position in energy access responsible for the 4TU team
- 2 tenure track researchers in energy access at each university
- 8 PhD projects, preferably executed by students from the Global South
- 20 master theses on energy access topics per university
- A dedicated energy access research lab facility
- At least 1 local living lab organized together with partner universities on each continent of the focus continents being Africa, central America, South America and Asia.
- Set-up of partnerships with a variety of local stakeholders bringing in multiple perspectives, for purposes of research and education
- Create a bigger pool for human capital building by matching demand from organizations with interests from students
- Conduct of multiple training programs/academies to train local academic staff
- Provision of additional training programs/academies for students

- Provision of training and guidance for aspiring entrepreneurs with objectives that align with ours

Technical University of Delft

The TU Delft values research and education related to LIMCs and supports this ambition mainly through the TU Delft | Global Initiative in its Energy Access for All program. TU Delft has a variety of researchers working on the Energy Access theme in topics ranging from the WEF-nexus to off-grid systems, to public policy analysis and context-specific design methodologies.

University of Twente

The University of Twente (UT) has a specialized group in energy access that takes a transdisciplinary approach. In the field of electrical engineering, which encompasses electromagnetic compatibility and power electronics, the primary goal is to improve power quality to better serve the users. In the area of technology management, UT works on co-creation processes for innovations in the decentralized renewable energy field. UT researchers also work on philosophical and sociological frameworks to analyse the social impacts of energy access technologies.

Wageningen University & Research

The wide range of energy access themes at Wageningen University range from energy sovereignty, energy democracy and just energy transition, typically in relation to some of WUR's key themes of climate change, biodiversity and food. Researchers and teachers working on energy access closely connect with the WUR Energy Alliance, which is a bottom-up university-wide network of researchers and teachers working on three key pillars: social, spatial and technological aspects.

Technical University of Eindhoven

The Technical University of Eindhoven works on energy access topics mainly in the department of Industrial Engineering and Innovation Sciences (IE&IS) and to some extent in Electrical Engineering (EE). The scientific staff in IE&IS works on topics that cover the assessment of functionality and sustainability of off-grid systems investigated from a holistic socio-technical systems perspective. Energy economics and circularity are important focus areas in their work. The IE&IS activities distinguish themselves by their strong focus on the historical context and engagement with critical development studies, connecting access-to-energy topics to the decolonization agenda. The Electrical Energy Systems group in EE facilitates student and PhD projects on design and configuration of mini grids powered by renewable energy sources.

ⁱ <https://www.un.org/sustainabledevelopment/blog/2021/06/report-universal-access-to-sustainable-energy-will-remain-elusive-without-addressing-inequalities/>

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ⁱⁱⁱ <https://sdgs.un.org/goals/goal7>