Loughborough University

This item was submitted to Loughborough's Research Repository by the author.
Items in Figshare are protected by copyright, with all rights reserved, unless otherwise indicated.

Developing a research agenda for community energy resilience in the electricity sector

PLEASE CITE THE PUBLISHED VERSION

https://energyeconomicgrowth.org/publication/eeg-energy-insight-developing-research-agenda-community-energy-resilience-electricity

PUBLISHER

Department for International Development (DFID) © Applied Research Programme on Energy and Economic Growth

VERSION

VoR (Version of Record)

PUBLISHER STATEMENT

This work is made available according to the conditions of the Creative Commons Attribution 4.0 International (CC BY 4.0) licence. Full details of this licence are available at: http://creativecommons.org/licenses/by/4.0/

LICENCE

CC BY 4.0

REPOSITORY RECORD

To, Long Seng, and Marcela Tarazona. 2019. “Developing a Research Agenda for Community Energy Resilience in the Electricity Sector”. figshare. https://hdl.handle.net/2134/34242.

Energy and Economic Growth
Applied Research Programme

Developing a research agenda for community energy resilience in the electricity sector

EEG Energy Insight

The UK Department of International Development- (DFID-) funded Energy and Economic Growth Programme (EEG) is partnering with Low Carbon Energy for Development Network (LCEDN) to catalyse new research collaborations on community energy resilience in low-income countries, with a focus on opportunities in on-grid, mini-grid, and stand-alone electricity systems. This six-month project is supported by the UK Energy Research Centre (UKERC) Whole Systems Networking Fund. The project was launched on 1 June 2018 during a session at the LCEDN Annual Conference held at Loughborough University, UK, on 'Resilience Concepts for Energy'. This brought together a number of perspectives on community energy resilience. This Energy Insight document introduces the project and summarises the discussions at the LCEDN conference.

Long Seng To and Marcela Tarazona

June 2018



Oxford Policy Management
UKERC UK Energy Research Centre
EPSRC Engineering and Physical Sciences Research Council
LOW CARBON ENERGY FOR DEVELOPMENT NETWORK
UKaid from the British people

About the project

Many low-income countries are vulnerable to natural hazards, long-term processes of ecological degradation, and global climate change. These factors threaten progress towards economic development enabled by energy access. Despite this, researchers have until recently failed to address resilience in the design and development of sustainable energy systems. Research on energy access in low-income countries has also tended to be divided between on-grid, mini-grid, and stand-alone solutions. However, communities often utilise different combinations of systems in a strategic way. This project is designed to open up a dialogue around these issues by exploring the potential of a whole systems energy research approach to address questions of community resilience.

The **aim** is to establish research collaborations on community energy resilience in low-income countries using a whole systems energy research approach, bringing together social science perspectives on governance, economic modelling, disaster risk management, and technical expertise on designing resilient infrastructure. The project will focus on opportunities to increase community energy resilience in on-grid, mini-grid, and stand-alone electricity systems in South Asia and sub-Saharan Africa.

The project **objectives** are to:

1. facilitate knowledge exchange and establish a working relationship between academics, policymakers, energy practitioners, and donors in the UK, South Asia, and sub-Saharan Africa;
2. identify research opportunities to increase community energy resilience in on-grid, mini-grid, and stand-alone electricity systems; and
3. explore opportunities to extend this research area through further funding.

This will be achieved through three workshops in 2018 to further develop and engage stakeholders in this research area and to develop joint proposals for future work. These workshops will be held in:

- September in the UK;
- October in South Asia; and
- November in sub-Saharan Africa.

Outputs will include a webinar, a working paper, a policy briefing, and a project report.

This project is led by the LCEDN and EEG. LCEDN is a network of UK researchers focused on renewable energy and international development. LCEDN is involved in delivering capacity building activities for DFID's Transforming Energy Access (TEA) programme, which focuses on enabling energy access via stand-alone and mini-grid systems. EEG is an applied research programme examining the role of energy in driving economic growth in low-income countries to aid policymakers in designing large-scale (grid) energy systems. This networking project establishes a working relationship between LCEDN, EEG, and TEA, and thus links UK research expertise with DFID's two major programmes looking to invest in research and capacity building in the energy sector. This project will develop joint research that is highly relevant to both programmes.

Resilience concepts for energy

Community energy resilience includes both the resilience of energy systems to shocks and stresses, as well as the contribution of energy to improving community resilience. The presentations at the 'Resilience Concepts for Energy' session at the LCEDN Annual Conference session examined disasters, the long-term planning required to improve energy resilience, as well as how resilient energy systems can contribute to community resilience through improved livelihoods. Summaries of the three presentations and discussions are given below and further details about the LCEDN conference can be found in the appendix. Copies of conference presentations will be made available at www.lcedn.com.

Chair's remarks

Marcela Tarazona, director of EEG, welcomed participants to the session and highlighted the importance of this topic. Energy is key to economic growth, but governments do not always prioritise re-establishing energy access after disasters. In addition, community energy resilience is linked to the movement from a reactive approach to disaster response, to a proactive approach of disaster risk management.

Community energy resilience in Nepal

Long Seng To, from Loughborough University, presented research on energy access in four affected districts a year after the 2015 major earthquakes in Nepal. The earthquake created a sense of existential vulnerability and disruption to daily life. The results showed that most households had re-established some form of energy access after the earthquake through using multiple sources of energy (or fuel stacking) as a resilience strategy. Energy access was often re-established through processes of community-based resourcefulness, and of 'making do' in the first stage of recovery. Households relied on informal governance and social structures to regain access to energy after the earthquake. The role of international organisations, government agencies, and international non-governmental organisations (NGOs) was much stronger in other areas of recovery. Full restoration of energy services was slow and failure to restore services was a key factor in the continued disruption to people's everyday lives. There were also inequalities in relation to which communities were able to restore their own energy services.

Adaptation for buildings: from both long-term and short-term perspectives

Hu Du, from Cardiff University, presented his work on climate change and energy in buildings. He is developing new concepts for energy positive buildings, including HABITAT, a plug-n-harvest modular facade for buildings on the Tibetan Plateau. He is also using near-term weather forecasting data to understand building energy demand and renewable energy production. Hu Du plans to bring together a group of researchers from the UK and China for a workshop on 'renewable energy systems in zero carbon villages' in Lhasa in August 2018.

Financial aspects of community energy resilience

Collen Zalengera, from Mzuzu University, presented on his work on renewable energy systems in Malawi. He emphasised the importance of energy systems as physical assets that are needed to achieve livelihoods outcomes. Vulnerability is also the result of hazards and weaknesses in infrastructure. Malawi has experience in micro-grids and biogas projects which have failed as a result of inappropriate design and lack of long-term financial arrangements for maintenance and repairs. A lack of professionalism, innovation and entrepreneurship are key barriers to delivering resilient energy solutions. Delivery of resilient energy systems requires deep-rooted collaborations to deliver the needed technology and financial framework. This should involve the community, regulators, government departments, NGOs, companies, and training institutions. Increasing investments in renewable energy in Malawi offer business opportunities to deliver resilient infrastructure.

Discussion

Reflecting on the three presentations, Marcela Tarazona commented that they highlighted the need for donors to be more aware of how communities are coping with energy needs after disasters, and emphasised the importance of technology and planning for energy resilience. Three things that governments need to think about in relation to energy resilience are putting a plan in place, agreeing a decision making protocol, and putting finance in place. These need to be integrated into plans for disaster risk management. Marcela called for participants to not only ask questions, but to also provide input into the development of the Research Collaborations for Community Energy Resilience in Low-Income Countries project.

Themes discussed included:

- short-term coping capacity and long-term transformational capacity of cities and rural areas after disasters;

- interlinkages between energy and other sectors (e.g. health and education), and how a sub-optimal state in energy systems affects other systems;
- consideration of the energy security context of a country;
- coping mechanisms at different scales, including community, city, and national levels;
- using a common pool resource perspective to maximise resilience;
- reasons for loss of energy services after several years after connection; and
- building back better by replacing the grid with more resilient decentralised energy options.

Examples raised included Nepal, the UK, India, Sri Lanka, Kenya, and Puerto Rico.

Conclusion

The session on 'Resilience Concepts for Energy' at the LCEDN Annual Conference yielded rich discussions on what the concept of energy resilience might cover. The presentations revolved around community energy needs after disasters, technical developments for building adaptations, the importance of linking energy resilience and livelihoods, as well as the longevity of energy systems. The participants also pointed to other areas, including the importance of working at multiple scales and across different sectors, and considering short-term and long-term mechanisms. These will be explored further in three workshops in 2018, as part of the Research Collaborations for Community Energy Resilience in Low-Income Countries project.

Acknowledgements

We would like to thank Freya Stanley-Price and Joni Cook for helping to document the session.

Appendix: LCEDN conference and session details

LCEDN 7th Annual Conference: Transforming Energy Access?

Holywell Park Conference Centre, Loughborough, United Kingdom

30 May – 1 June 2018

The LCEDN annual conferences provide opportunities to meet with colleagues from across the world with interests in low carbon transitions and in addressing energy access challenges (be they providing electricity or modern cooking services). The events are expressly inter-disciplinary, bringing together researchers with backgrounds in science, engineering, economics, and business, and the full gamut of social sciences.

The other raison d'etre of the LCEDN is to bring together the academic community with those working in other sectors. Sessions focus on the private sector (both large- and small-scale), different approaches towards innovation in different sectors, grassroots mobilisation and community engagement, and interactions with policymakers and other key stakeholders.

This year our conference is being delivered alongside the team coordinating DFID's Transforming Energy Access initiative (the Carbon Trust, Energy4Impact, University of Cape Town and The Energy and Resources Institute in India) hence the strapline for this year's conference.

During our sessions this year, we will address what it will take to fundamentally transform energy access in new directions. The issues to be explored will include but are in no way limited to:

- The social/equity impacts of current and intended energy access programmes (including gender, age, disability etc.)
- Innovative forms of access to finance and alternative delivery mechanisms
- Different approaches to innovation
- New approaches in clean cooking
- Confronting waste in low carbon transitions
- More than entrepreneurialism: energy and local development planning
- Local energy governance

Session: Resilience concepts for energy

11:00-12:30, Friday 1 June

In this session, we will discuss the emerging concept of energy resilience, focusing on the community level. What are the resilience issues which are most important for the energy sector? How can energy systems contribute to resilience at different levels (e.g. community, regional and national)? What can we learn from resilience thinking in other sectors?

Chair: Marcela Tarazona, Oxford Policy Management

Speakers:

- Long Seng To, Loughborough University - community energy resilience after the earthquake in Nepal (15 min)
- Hu Du, Cardiff University - "Adaptation for buildings – from both long term and short term perspectives" (15 min)

- Collen Zalengera, Mzuzu University - financial aspects of community energy resilience: energy business opportunities in the light of the policy and legal framework in Malawi (15 min)

About the authors

Dr **Long Seng To** is a Research Associate at Loughborough University and is Principal Investigator for the Research Collaborations for Community Energy Resilience in Low-Income Countries project. She is part of the secretariat for the LCEDN and has contributed to the 'Partnerships for Skills Development: An LCEDN Programme of Support for DFID's Transforming Energy Access Initiative'.

Her other research interests include agro-industries and clean energy in Africa, and the role of energy in achieving the Sustainable Development Goals. Long Seng holds a BEng in Photovoltaics and Solar Energy, a BA in History and Philosophy of Science and a PhD from the University of New South Wales. She holds visiting positions at University College London and University of Surrey, and is a member of the UN Economic Commission for Europe Expert Group on Resource Classification, Renewables Working Group.

Marcela Tarazona is responsible for overall delivery of the EEG applied research programme, working closely with top policymakers in low income countries, academics, and other energy practitioners, and guiding the programme approach to deliver research that is high quality and responsive to the needs and demands of policymakers.

Marcela brings together fifteen years of experience within academia (Visiting Professor at Georgetown University and Universidad de Los Andes, PhD at Toulouse School of Economics, and Research Associate at University of East Anglia); with international donors (World Bank and Inter-American Development Bank); and as a principal consultant at Oxford Policy Management (OPM).

Marcela's main areas of work include climate and disaster risk finance and insurance. She leads OPM's work in climate finance and is the climate finance lead for Action on Climate Change, a technical assistance programme mainstreaming climate change into development and planning in nine locations in five South Asian countries.

Front cover image: Vladimir Zhoga