Institution: Loughborough University

Unit of Assessment: C14 Geography and Environmental Studies

Title of case study: Achieving access to affordable, reliable, sustainable and modern energy for all: Making a success of United Nations Sustainable Development Goal 7

Period when the underpinning research was undertaken: 2012-2020

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Prof Ed Brown	Professor of Global Energy Challenges	1998-present
Dr Simon Batchelor	Visiting Research Fellow	2014-present
Dr Jonathan Cloke	Senior Research Associate	2013-2020
Dr Jonathan Leary	Senior Research Associate	2014-present
Dr Long Seng To	RA Eng Engineering for Development Research Fellow and Lecturer	2017-present

Period when the claimed impact occurred: 2014-2020

Is this case study continued from a case study submitted in 2014? N

1. Summary of the impact (indicative maximum 100 words)

The United Nations Sustainable Development Goal (SDG7, clean energy for all) has been failing to meet its target for cleaner cooking (UN SDG Report, 2020). Research at Loughborough University has helped to change the global focus on electricity provision from technical innovation to 'contextual approaches' and overturned conventional wisdom that electric cooking cannot be developed in low-income communities. By providing frameworks to achieve SDG7, the UK Foreign, Commonwealth and Development Office invested £39.8 million in the Loughborough Modern Energy Cooking Services (MECS) programme, leading to the following impacts: 1) Transformed UK and International Government, NGO, and Investment Bank investment strategies for SDG7; and 2) Directly invested UK government funds and leveraged private investment in new products and markets for MECS in the Global South.

2. Underpinning research (indicative maximum 500 words)

The burning of biomass (wood, plants, animal waste) is a global health and environmental problem. It also constitutes an energy crisis. The World Health Organisation estimates that household air pollution from cooking with traditional solid fuels contributes to between three and four million premature deaths every year (UN 2020), more than malaria and tuberculosis combined, and disproportionately affects women and children. Biomass fuels produce 'black carbon', a potent greenhouse gas. 34% of biomass is from unsustainable sources, concentrated in depleted, rapidly urbanising 'hotspots' in South Asia and Africa. Providing "access to affordable, reliable, sustainable and modern energy for all" (UN SDG7), particularly modern cooking services (SDG7.1) would solve this global health and energy crisis. UN SDG7 is also pivotal to meeting the UN's climate change targets.

Led by Professor Ed Brown, the Loughborough team transformed existing knowledge and practice about SDG7, sustainable energy and Modern Energy Cooking Services (MECS) in the Global South. Research income totalling £4.2 million (spent funds dedicated to research at Loughborough during the REF period) – from Department for International Development (DFID) now Foreign, Commonwealth & Development Office (FCDO), Department for Energy and Climate Change (DECC), and UK Research Councils (ESPRC) – has supported participatory research in partner communities, interviews with key political,

policy and commercial stakeholders, large-scale surveys and quantitative modelling. The extensive qualitative research alone included over 1,000 people in 20 countries.

Our key intellectual contributions provide sustainable models for addressing SDG7, comprise new, holistic interdisciplinary *contextual social energy systems approaches*, and demonstrated for the first time the possibility of global reach for electric MECS, even amongst low-income populations in the Global South. Original contributions from our *contextual social energy systems approaches* are:

- **Effective policy interventions must start from an understanding of local contexts**, cultures, stakeholders, enterprises and infrastructures in specific places **[R1, R2].**
- **Network and skills development are needed for low carbon energy transitions**. Achieving low carbon energy transitions is inherently relational and reciprocal social relationships and networks must be developed to transform energy systems **[R1].**
- **The pivotal role of effective local government and governance** to accelerating the speed and scale of implementation for distributed energy systems and enhancing their sustainability and socio-economic impacts **[R3].**
- **The importance of community**. We have shown that energy access should not be seen as an individual service focused on income and employment but as one thread in a social fabric of community service provision **[R2, R4].**

Subsequently, our research on MECS *has overturned existing understandings of cleaner cooking in the Global South* with the following original contributions:

- **The revolutionary potential of electric cooking to address SDG7.1.** Increased electrification has opened up the potential to transition from biomass (and kerosene) to cooking with electricity **[R5],** with the potential to achieve rapid transitions to clean and sustainable cooking in households in the Global South.
- **MECS provide crucial new business models** for organisations promoting increased access to electricity **[R5, R6].**
- **Harnessing the mutual benefits of MECS and electricity access enhances low carbon energy transitions [R5, R6].** As electricity coverage increases over the Global South, there are new market opportunities for MECS. Using MECS also provides a market for electricity.
- **Innovative business modelling and financing** is critical for technological development underpinning low carbon energy transitions **[R6]**.
- **A contextual approach** sensitive to cultural mores is also required **[R5].**

3. References to the research (indicative maximum of six references)

R1. Brown E, Campbell B, Cloke J, To LS, Turner B, Wray A (2017) Low carbon energy and international development: from research impact to policymaking, *Contemporary Social Science*, 13, 112-127 https://doi.org/10.1080/21582041.2017.1417627
R2. Cloke J, Mohr A, Brown E (2017) Imagining renewable energy: towards a social energy systems approach to community renewable energy projects in the Global South, *Energy Research and Social Science*, 31, 263-272 https://doi.org/10.1016/j.erss.2017.06.023
R3. Zalengera C, To LS, Sieff R, Mohr A, Eales A, Cloke J, Buckland H, Brown E, Blanchard R, Batchelor S (2020) Decentralization: the key to accelerating access to distributed energy services in sub-Saharan Africa?, *Journal of Environmental Studies and Sciences,* 10, 270-289 https://doi.org/10.1007/s13412-020-00608-7
R4. Campbell B, Cloke J, Brown E (2015) Communities of Energy, *Economic Anthropology,* 3, 133-144 https://doi.org/10.1002/sea2.12050
R5. Batchelor S, Brown E, Leary J, Scott N, Alsop A, Leach M (2018) Solar electric cooking in Africa: where will the transition happen first?, *Energy Research and Social Science*, 40, 257-272 https://doi.org/10.1016/j.erss.2018.01.019
R6. Batchelor S, Brown E, Scott N, Leary J (2019) Two birds, one stone—reframing cooking energy policies in Africa and Asia, *Energies,* 12, 1591-1619 https://doi.org/10.3390/en12091591

The research has been published in high-quality international peer reviewed journals. The research was funded by competitively-awarded grants totalling £4.2 million from UK Research Council, UK Government and EU sources. Assessments from DFID have given all projects the highest rating.

4. Details of the impact (indicative maximum 750 words)

The Loughborough team's research on MECS has generated a new global approach to addressing SDG7's commitments to "access to affordable, reliable, sustainable and modern energy for all" and "universal access to modern energy cooking services" via **three pathways:**

1. The **Low Carbon Energy for Development Network** was co-founded by Brown in 2012 to generate collaboration between academics, policy shapers and practitioners. It has: convened workshops in the Global South; a policy-focused website; published working papers; and held annual conferences attracting 93 research institutions, businesses, NGOs and government institutions from 19 different countries including DFID and Innovate UK, and 116 low carbon energy stakeholders of 27 nationalities.
2. Networking through the Low Carbon Energy for Development Network has led to the Loughborough team addressing and shaping agendas at **landmark global events**. In 2019 *alone* the team addressed the UN Climate Change Summit, New York and 25th UN Climate Change Conference, Madrid. The team has also participated in other key events for academics, practitioners, and policy shapers, including the bi-annual Clean Cooking Forum and the Global Off-Grid Solar Forum and Expo, Nairobi.
3. The significance of the research is reflected in the team being **invited partners** with key international organisations, holding **advisory roles** on the World Bank's Energy Storage Partnership, The UN Sustainable Energy 4All's Energising Finance Steering Committee, the World Health Organisation's Health and Energy Platform for Action, and the UN's Multi-stakeholder Technical Advisory Group on SDG7. The team co-produced two reports with the World Bank about clean and electric cooking, and co-produced the World Bank's launch presentation of the Clean Cooking Fund and the Health and Energy Platform for Action at the UN Climate Action Summit, 2019 **[S6]**.

These pathways have led to two multifaceted impacts:

Impact 1: Transformed UK and International Government, NGO and Investment Bank (e.g., World Bank) investment strategies for SDG7

The research underpinned decisions to redirect investment away from technology focused solutions towards contextual social energy systems approaches **[R1, R6, R4]**; "*previously under-researched elements of energy access practice*" **[S1]**. For example, the research shifted investment strategies to pursue capacity building programmes for local government, leading the EU and Kenyan government to invest €3.5 million in Loughborough, French, and Kenyan partners to implement county-level energy sector capacity building **[R3, S2]**.

The team's research redirected investment away from cleaner solid cooking fuels to MECS. Prior to 2018, UK government policy, in line with global consensus among government, multilateral and non-government organisations, promoted improved biomass cookstoves, in partnership with the Global Alliance for Clean Cookstoves (GACC), now the Clean Cooking Alliance (CCA) – based in New York, with reach across the Global South. Bangladesh, China, Ghana, India, Kenya, Nigeria, and Uganda are focused countries providing 'learning labs' for best-practices and toolkits for other partner companies. The CCA partners with private companies and multilateral organisations including the WHO and World Bank. Both DFID/FCDO and GACC policy and investment strategies were transformed as a result of the Loughborough Team's research **[R5]**, which is credited as "*leading the sector to a new paradigm*" **[S3].** The Senior Infrastructure Adviser at FCDO stated that

> "*As a direct result of the findings of [Loughborough University] research the Research and Evidence Department developed its £18m Modern Energy Cooking Services*

research programme that was approved by ministers … MECS research was specifically designed to initiate a transformation in the sector that focused on developing practical and affordable solutions and technologies offering cooking with electricity and other modern fuels: an approach deemed impossible prior to the research of Prof. Brown and his team…FCDO increased the overall funding of the programme to £40 million." **[S4]**

The DFID (FCDO) funded *MECS* programme represents a significant investment of UK development funds of £39.8 million (£8.1m research income; £25.35m directly managed; £6.35m contracted directly to the World Bank between 2019-2024). Other organisations have also changed their investment approaches, such as CCA, who reported

"*a real shift in the organisation's thinking … we are working with the Nepalese government in designing its energy policies and championing electric cooking in Nepal. The aim is to reach 80% use of electricity and clean cooking devices in place of traditional fuels…This push would not have happened without the invaluable contribution of the research and thought leadership emanating from Ed (Brown) and his team*" **[S5].**

The team's research **[R5, R6]** also instigated a transformation in international organisations' (e.g., World Bank) investment strategies, shifting them towards electric cooking. The World Bank's new $500 million Clean Cooking Fund directly incorporates electric cooking promotion. Following the original findings of the Loughborough Team **[R6]**, the researchers collaborated with experts in the World Bank; for instance, MECS partnered with the World Bank's Energy Sector Management Assistance Program; a global knowledge and technical assistance programme, to change approaches to clean cooking **[S6]**.

The research and influence of the Loughborough Team have transformed the approach of NGOs with significant reach. Three indicative examples are detailed below.

i. The US-based NGO Collaborative Labeling and Appliance Standards Program (CLASP) is the leading international voice for off-grid appliance energy efficiency policies and market acceleration initiatives globally. CLASP have re-oriented their activities in response to the Loughborough research generating new markets for electric cooking appliances:

"*the outcomes of this research have significantly influenced CLASP's energy access work over the last 2-3 years to the extent that the promotion of EPCs (electric pressure cookers) has become the number one priority/project within our organisation… we estimate that this will result in up to 8,000 electric pressure cookers being sold … across Kenya by October 2020. We estimate this will impact/benefit around 32,000 individuals in Kenya*" (Director Clean Energy Access, CLASP).

The research is also improving people's lives in Kenya. A key benefit is time saving (which disproportionately affects women) of around two hours per meal, along with health and environmental benefits. CLASP have leveraged over £0.5m investment funding for electric pressure cookers **[S7].**

ii. Beyond the Grid Fund for Africa (BGFA) programme is a Swedish, Danish and German government funded NGO working across Africa "*to bring clean, affordable off-grid energy to at least 5 million people by 2025*" **[S8].** Considering the research of the Loughborough Team, BGFA added funding for MECS into their scaled-up funding programme for Burkina Faso, Liberia and Zambia. The Director of BGFA emphasised that

"…the MECS research … helped open our eyes to the economic and development potential…of electric cooking, even in the offgrid environment, whereas previously our focus had been on the more conventional aspects of clean cooking such as cleaner solid fuels...This has resulted in BGFA creating a special incentive to promote the use of electric cooking especially in connection with the deployment of mini-grids in some of the funding windows of the BGFA1 (Burkina Faso, Liberia & Zambia)."

The incentive is a multiplier for companies that include electric cooking. BGFA have substantial reach, with 1 million total beneficiaries in Zambia from their pilot work.

iii. Hivos, a Netherlands based NGO**,** added electric cooking services to their portfolio as a result of the Loughborough Research **[R5, R6]**. Hivos currently supports over 120,000 households under their biogas programme throughout Africa and Indonesia and their switch to focus on electric cooking is significant for the reach and influence of the research **[S9].**

Impact 2: Directly invested UK government funds and leveraged private investment in new products and markets for MECS in the Global South

The Loughborough team's research emphasised that MECS provide crucial new business models for organisations, promoting increased access to electricity **[R5, R6]** and that innovative business modelling and financing is critical for the technology and market development essential to low carbon energy transitions **[R6]**. The MECS programme includes a significant £17.5 million component which is set aside for the Team to invest into MECS business and market development ventures including partnerships with innovative financial service providers and a significant Challenge Fund (£7.5 million). So far, the Challenge Fund has invested £1.48 million (until 31st July 2020), in supporting 43 companies to develop MECS products (e.g., electric pressure cookers), services and market development (e.g., cookbooks) in the Global South.

Burn Kenya provides an example of the impact of these investments. Burn are the only modern cookstove manufacturer in Sub-Saharan Africa, producing 45,000 stoves per month and employing over 400 people. Until their engagement with the *MECS* programme they exclusively made solid-fuel stoves. The research of the Loughborough Team **[R6]** *"…changed our strategy to invest in manufacturing energy-efficient electric appliances at scale*" with expanded premises for "*a dedicated production facility for electric pressure cookers"* **[S10].** Burn Kenya received £200k from the Challenge Fund to support market and product development. In partnership with Loughborough, Burn leveraged a further £610k in funding from NGOs and UK government sources. The Loughborough team collaborated with Burn to leverage funds from Energising Development (funded by the Dutch Ministry of Foreign Affairs and the German Federal Ministry for Economic Cooperation and Development) to provide sustainable energy access to 20 million people **[S10]**. The CEO of Burn Kenya reported that:

> "*The MECS Team have helped transform our ideas about approaches to modern cooking services; enabled us to access new markets; directly invested UK government development funds into our market, product development and manufacturing processes; supported us to apply for further UK government research funds; and enabled us to apply for non-governmental and UK government funding to develop and generate markets for electric cooking products*" **[S10].**

5. Sources to corroborate the impact (indicative maximum of 10 references)

S1: Testimonial letter, Senior Energy and Infrastructure Advisor, Research and Evidence Division DFID at the time of commissioning the *MECs* Programme. 20.4.20.
S2: External review of USES programme: International Organisational Development. 25.1.19
S3: DFID's *MECS* business case. 1.6.2018
S4: Testimonial letter, Senior Infrastructure Adviser, Growth Research Team DFID/FCDO.
S5: Testimonial letter, CEO Global Alliance for Clean Cookstoves. 25.1. 21.
S6: World Bank: press release. 23.9.19; testimonial letter Global Director, Energy and Extractives Global Practice. 3.10.19; two co-produced reports on clean cooking. 2020.
S7: Testimonial letter, Director Clean Energy Access Collaborative Labeling and Appliance Standards Program (CLASP). 30.3.20.
S8: Testimonial letter, Director of Investment and Strategy Beyond the Grid Fund for Africa.
S9: Testimonial letter, Programme Officer Renewable Energy, Hivos. 21.1.21.
S10: Testimonial letter, Burn CEO. 08/01/21.