Low carbon energy and development in low-income countries

Photo: Child studying - Zambia ©SolarAid/Patrick Bentley

Sustainable energy technologies could contribute significantly to human development and economic growth in low-income countries. Public policy has an important role to play in fostering the markets for these technologies. This briefing summarises key policy lessons from historical research explaining the success of the market for off-grid photovoltaics (PV) in Kenya (including solar home systems and solar portable lights). For details on the project and its outputs, visit www.steps-centre.org/project/low_carbon_development

Key policy recommendations

1. Market forces alone will not drive the widespread uptake of low carbon energy technologies in low-income developing countries.

2. Governments have an important role to play in fostering low carbon technology markets through a range of interventions:

- Build networks that link diverse stakeholders

- Conduct market and technological research and monitoring, making results publicly available

- Raise awareness amongst consumers and investors to reduce perceived risks and build shared visions

- Fund experimental initiatives (eg new stakeholder configurations to test new technologies and approaches; connect supply chains; establish value added activities such as product assembly and manufacture)

3. National institutions like Climate Innovation Centres could achieve this, but must be designed to do so. They should link across countries to learn lessons and share best practice.

Introduction

More than 300,000 homes in Kenya are estimated to have a PV system. The number of solar portable lights is claimed to be greater than 100,000.

The success of Kenya's off-grid solar energy market has often been assumed to be the result of free market forces. However, the market's growth is, in fact, the result of activities by key actors over time which could be replicated by policy interventions.

Many of those involved were private sector actors. However, acting both with and without donor funding and support, they pursued various capacity building activities that put in place elements of an innovation system that previously did not exist. The presence of donor funded projects and programmes, and the public availability of lessons learnt from these interventions, were also critical.

From this understanding of what happened in Kenya, we can identify broader policy recommendations.

Overarching policy goals

Policy should aim to build 'innovation systems' by linking together institutions who can initiate, import, modify and diffuse new technologies. Developing capabilities — the right skills, knowledge and links between different actors — is vital.

These networks must be **inclusive** — attending to the self-defined needs of poor people — if low carbon technology uptake is to be widespread and underpin low carbon development pathways. The result will be to provide **'protective spaces'** in which to foster low carbon energy technologies that begin to compete with existing energy regimes (currently dominated by wood fuel, diesel and kerosene).

Photo: Solar speciality shop in Gulu, Uganda by jamesharrisanderson on Flickr (cc-by-nc-sa 2.0)

Our research suggests policy should:

Build stakeholder networks

Diverse arrays of stakeholders, from technology importers and suppliers, through to technology users, should be linked by projects and programmes in **meaningful networks.**

This will help to identify current technological capabilities, where gaps exist and how they might be addressed. Projects and programmes such as these can also build new technological capabilities by supporting learning and experimentation within 'protective spaces'. Stakeholder networks also allow spaces to articulate and discuss user preferences, needs and energy consumption practices. This is critical to developing markets that address nascent demand as well as attending to the **needs of poor and marginalised people.**

Foster learning

A key role for policy is conducting **market research and monitoring**, ensuring the results are publicly available.

This public information reduces perceived risks amongst investors and technology users. It helps them to understand user needs and preferences, appropriate hardware components, performance of different technologies, and successful approaches – as well as the nature of past difficulties and how to overcome them. It also facilitates learning for future public and private initiatives.

Build shared visions

Building shared visions via **interaction with existing and potential technology users and suppliers** can be transformative for low carbon technology markets. By fostering understandings of what low carbon technologies can and cannot provide, how they work and the ways other users have benefited from them, users' expectations develop around different technological options.

This simultaneously provides **vital user feedback** on technology design and the configurations and brands that vendors and suppliers provide. Shared visions also inform choices about different development pathways, with attendant implications for potential market size and profitability.

Support experimentation

A key role for policy lies in providing **funding for experimentation**. Stakeholders throughout the supply chain need experience of low carbon technologies to learn what does and does not work within specific contexts (different countries, regions, villages, technologies, energy services, etc).

Experiments might be multi-stakeholder projects that test and develop ideas: e.g. new technical configurations, new hardware, new practices around existing technologies, new energy consumption practices that could improve the benefits accrued by users, and so on. Experiments might also be mutually supportive interventions that **link different stakeholders across markets** to build supply chains and foster new market opportunities. And experiments could work 'upwards' through value chains, building on existing markets to develop higher-value segments, thereby fostering increasing economic returns from low carbon energy initiatives.

Climate Innovation Centres

To foster low carbon technology, appropriate institutional structures are needed. This can be done using national institutions like **Climate Innovation Centres** or other similar centres, like Innovacion Chile[1]. However, such centre-based approaches must be specifically designed to focus on the considerations outlined in this briefing.

Whilst these centres are independent, there is significant value in linking them up, so learning can be shared across borders and cultures.

[1] www.innovacion.cl

Next steps: Towards sustainable energy for all

It is important to note that the findings of this study are based on one specific case: off-grid PV in Kenya providing electricity for lighting, phone-charging and so on. Whilst these policy recommendations might prove valuable across other technological and country contexts, there is an urgent need for further research to test this through comparative analysis.

Funding is currently sought for a programme of research which builds on the current study, applying the conceptual approach across a range of countries, low carbon technologies and energy services. **Please contact d.g.ockwell@sussex.ac.uk for further information.**

Photo: Solar lights – Senegal ©SolarAid/Kat Harrison

Further reading

Byrne, R., Smith, A., Watson, J. and Ockwell, D. (2011) Energy Pathways in Low-Carbon Development: From Technology Transfer to Socio-Technical Transformation, STEPS Working Paper 46, Brighton: STEPS Centre

Byrne, R., Smith, A., Watson, J. and Ockwell, D. (2012) Energy Pathways in Low Carbon Development: The Need to Go beyond Technology Transfer, in Ockwell, D. and Mallett, A. (Eds.), Low carbon technology transfer: from rhetoric to reality, Routledge, Abingdon

Further publications from this project are on the STEPS website at www.steps-centre.org/project/low_carbon_development

Find out more

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Credits

This briefing was written by David Ockwell and Rob Byrne and edited by Nathan Oxley.

About Us

The Africa Technology Policy Studies Network (ATPS) is a transdisciplinary network of researchers, policy makers, private sector actors and civil society actors that promotes science, technology and innovation (STI) policy research, dialogue and practice, for African development. With a Regional Secretariat in Nairobi, Kenya, it operates through National Chapters in 29 African countries and Africans in Diaspora with an expansion plan in place to cover the entire Africa.

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The STEPS Centre (Social, Technological and Environmental Pathways to Sustainability) is an interdisciplinary global research and policy engagement hub uniting development studies with science and technology studies. Based at the Institute of Development Studies and SPRU Science and Technology Policy Research, at the UK's University of Sussex, we work with partners around the world and are funded by the Economic and Social Research Council.

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The Sussex Energy Group undertakes academically rigorous, inter-disciplinary research that engages with policy-makers and practitioners. The aim of our research is to identify ways of achieving the transition to sustainable, low carbon energy systems whilst addressing other important policy objectives such as energy security. We have funding from a diverse array of sources. We are a core partner in the Tyndall Centre for Climate Change Research and part of the UK Energy Research Centre.

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