

Institution: University of Sussex		
Unit of Assessment: 17 – Business and Management Studies		
Title of case study: Redesigning global climate technology policy and funding to meet the needs of poorer developing countries		
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:
Robert Byrne	Senior Lecturer, Science Policy Research Unit (SPRU)	2008 – present
Period when the claimed impact occurred: 2015 – 2020		
Is this case study continued from a case study submitted in 2014? N		
1. Summary of the impact <p>Sussex researchers have designed a new global climate technology policy approach to address historic failures in meeting the needs of poorer developing countries. Globally, this new approach has: informed the United Nations Framework Convention on Climate Change's review and future direction of its climate technology policy; been adopted as a funding mechanism by the USD10.3 billion Green Climate Fund (GCF); and informed the World Bank's review of its climate technology approach in developing countries. At a continental level, the policy approach has been adopted by the African Union to train African government and intergovernmental policymakers in leveraging international climate funding. At a national level, the approach is being implemented by 16 policy organisations from nine different African countries, framing national policy and practice and underpinning GCF proposals, which have so far secured almost USD10 million to fund work towards meeting international climate change goals.</p>		
2. Underpinning research <p>Facilitating the transfer of technologies that help to mitigate or adapt to climate change (such as drought-resistant farming and low-carbon energy) to developing countries has been a core aim of global climate policy for the last three decades. It is, however, widely viewed to have failed, benefiting only richer developing countries and international companies who supply the technologies. For example, under the Clean Development Mechanism – one of the core global policy mechanisms that fund climate technology transfer – China accrued around 60% of total investment and India around 11%. Africa, including South Africa and the relatively richer countries of Northern Africa, accrued only 3% [R1].</p> <p>Based on a combination of long-term empirical analyses in Sub-Saharan Africa [R2, R3], India and China and inter-disciplinary conceptual work (developed over a decade and summarised in [R1]), Sussex research has both demonstrated how climate technologies can be successfully transferred, and designed a new policy approach to make this happen [R4]. The research focused mostly on energy technologies, but also developed conceptual and practical policy insights of relevance to climate technologies more broadly. The key research insights that underpin this policy approach are:</p> <ol style="list-style-type: none"> 1. Traditional climate technology policy addresses only two dimensions of the problem, namely technology and finance, reflected in the dominance of engineering and economics in technology and development literature [R1, R3]. This ignores the importance of attending to socio-cultural [R5] and political [R2] dimensions that help or hinder technology transfer, and the need to build indigenous innovation systems in developing countries to foster broader change around new technologies [R1, R4]. Even where policy interventions have focused purely on the financial dimension, Sussex research has shown that aligning financial approaches with existing socio-cultural practices of paying for technology services (for example, light) amongst poor individuals and communities can explain the success and longevity of initiatives [R5]. 2. The research has highlighted the relevance of insights from the broader body of literature on national systems of innovation and applied this to show that, where climate technologies are 		

successfully transferred, it is due to long-term processes of building indigenous technological capabilities and strengthening the systemic contexts through which sustained uptake of new technologies can be nurtured [R1, R4]. National systems of innovation provide the context within which all processes of technology development, transfer and uptake occur. They encompass the network of actors (for example, firms, universities, government departments, NGOs, suppliers, consumers) within which innovation occurs, and the strength and nature of the relationships between them. In developing countries, particularly around newer climate technologies, these systems are often either weak or non-existent and need to be actively nurtured [R1, R4].

3. Importantly, by combining a 'national systems of innovation' theory perspective with conceptual insights from the strategic niche management literature, the research demonstrated that the 'national systems of innovation' perspective needed to be extended to also attend to the social contexts and the political and economic impediments to new technology uptake [R1, R2]. This led to a new theoretical contribution, which is based on understanding successful climate technology transfer as requiring the development of 'socio-technical innovation system building' in developing countries [R1].

The researchers used this understanding – grounded in new empirical analysis in Sub-Saharan Africa [R2, R3] – to formulate a concrete policy approach. The result was the Climate Relevant Innovation-system Builders (CRIBs) policy approach [R4]. This asserted that successful climate technology transfer requires key actors (individuals and institutions with knowledge of local contexts and people's needs) to focus on actively building the innovation systems that provide the context within which new technologies are adopted, along the whole supply chain from importers to suppliers, vendors, and consumers. This should be done in ways that are aligned with, or can evolve, poor people's existing socio-technical practices [R1, R4, R5] and existing political interests [R4].

The research is based on a long-term intellectual collaboration between Byrne and Ockwell (UoA 14 – Geography and Environmental Studies) that began in 2009, with Ockwell originally focusing more on innovation studies and energy geographies literatures in the context of climate technology transfer and Byrne focusing more on strategic niche management literature. The new empirical, theoretical and policy insights described above represent joint intellectual contributions that have emerged from over a decade of close collaboration, joint thinking and research, including co-convening the energy and climate research domain of the £9m ESRC Social, Technological and Environmental Pathways to Sustainability (STEPS) Centre.

3. References to the research

- R1** Ockwell, David and Byrne, Rob (2017) *Sustainable energy for all: technology, innovation and pro-poor green transformations*. Routledge, Abingdon, UK. Submitted to REF2. Described by one reviewer, Prof Marcus Power, Professor of Geography at University of Durham, as "without doubt the most critical and insightful treatment of the subject to date."
- R2** Byrne, Rob, Mbeva, Kennedy and Ockwell, David (2018) A political economy of niche-building: neoliberal-developmental encounters in photovoltaic electrification in Kenya. *Energy Research & Social Science*, 44: pp. 6-16 <https://doi.org/10.1016/j.erss.2018.03.028>
- R3** Ockwell, David, Byrne, Rob, Hansen, Ulrich Elmer, Haselip, James and Nygaard, Ivan (2018) The uptake and diffusion of solar power in Africa: socio-cultural and political insights on a rapidly emerging socio-technical transition. *Energy Research & Social Science*, 44: pp. 122-129 <https://doi.org/10.1016/j.erss.2018.04.033> (introductory article to a special issue showcasing contemporary work in the recent "socio-cultural turn" [see R1] in the energy and development literature)
- R4** Ockwell, David and Byrne, Rob (2015) Improving technology transfer through national systems of innovation: climate relevant innovation-system builders (CRIBs). *Climate Policy*, 16 (7): pp. 836-854 <https://doi.org/10.1080/14693062.2015.1052958>
- R5** Rolfs, P., Ockwell, D. and Byrne, R. (2015) Beyond technology and finance: pay-as-you-go sustainable energy access and theories of social change. *Environment and Planning A*, 47 (12): pp. 2609-2627 <https://doi.org/10.1177%2F0308518X15615368>

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G1. ESRC via the £9m [STEPS](#) (Social, Technological and Environmental Pathways to Sustainability) Centre, [2006-11](#), [2011-17](#), [2018-21](#). (Byrne & Ockwell co-convene the 'Energy & Climate Change' domain); **G2.** DFID Climate and Development Knowledge Network, £500k, 2012-14 (competitive 5.6% success rate) (PI: Ockwell, Co-I: Byrne); **G3.** International Social Science Council, £650,000 (Co-I: Ockwell; 0.6% success rate).

4. Details of the impact

The Sussex research that led to the CRIBs policy approach has had significant impact on policy and funding at global, continental and national levels.

4.1 Global climate policy impact

The UN Framework Convention on Climate Change's (UNFCCC) Technology Executive Committee – the political body responsible for implementing climate technology policy under the UNFCCC and the Paris Climate Agreement – used the CRIBs approach to evaluate its existing climate technology policy and inform its agreed way forward to improving it [S1]. In particular, it adopted the CRIBs recommendation that future technology interventions under the UNFCCC act as “innovation system builders” [S1]. The resulting recommendations were officially adopted by the UNFCCC Subsidiary Body for Implementation [S1, S2, pp.12, 16, 18, 20, 21]. The significance of this is highlighted by [text removed for publication] of the UNFCCC Secretariat, who acknowledged that the Sussex research:

“...has been adopted as a key concept in the technology development and transfer work and advice of the UNFCCC Technology Mechanism... It was also relevant in the context of the evaluation of the GEF [Global Environment Facility] Poznan strategic program on technology transfer (PSP) undertaken in 2018/19, as the UNFCCC Climate Technology Centre and Network and the PSP pilot regional centres operate as new climate innovation system builders, that connect actors and networks, provide technical and policy support and mobilize climate finance for climate technology projects.” [S3]

One mode through which the UNFCCC recommends climate technology transfer be achieved is via collaborative research, development and deployment. UNFCCC used CRIBs to frame its assessment of how to fund collaborative research and development through the Green Climate Fund (GCF). The GCF is a USD10.3 billion fund set up by the UNFCCC to finance global efforts towards attaining international climate change goals in developing countries. The GCF board acknowledged CRIBs as a policy approach and agreed to fund its implementation. It also used the analytical categories set out in Sussex's CRIBs paper [R4] to frame how the GCF would target its funding [S4, S5]. This includes whole sections of these GCF policy documents [S4, S5] that attend to “building innovation systems” and “understand[ing] and respond[ing] to context-specific conditions and needs” in recipient countries, as per the CRIBs paper [R4]. The policy documents [S4 pp.3-4, S5 pp.16-17 & 32] also directly cite the CRIBs paper and mention the CRIBs approach multiple times. [text removed for publication], UNFCCC Secretariat, confirms that the CRIBs approach “was central in advising the Green Climate Fund in 2018” [S3].

The CRIBs work was also used to inform a change in direction in the World Bank's Climate Technology Programme. This programme originally focussed exclusively on traditional mechanisms, such as supporting entrepreneurs and business incubation, but insights from CRIBs introduced the value of building innovation systems to achieve broader change. [text removed for publication] at the World Bank, confirmed that:

“Evidence, insights and recommendations from David Ockwell and Robert Byrne's publications on Climate-Relevant Innovation-systems Builders were valuable inputs to the strategy of the World Bank infoDev Climate Technology Program and to the development of its program activities. The publications provided a strong policy rationale and a convincing practical framework for the role of institutions in building innovation systems that advance climate technology goals in developing countries. [They] advance unique ideas that cannot be found elsewhere in the literature and therefore were a significant resource for the Climate Technology Program.” [S6]

As a result, the programme now includes “market ecosystem creation” as the first of its five core activities [S11].

4.2 Continental-level African climate policy impact

In the light of the difficulties faced by African countries in leveraging international climate finance, the African Union (AU) recognised the CRIBs approach as an opportunity for African countries to access GCF funding. It commissioned Sussex’s key research partner in Africa – the African Centre for Technology Studies (ACTS), which hosts the Africa Hub of the ESRC STEPS Centre’s Global Sustainability Consortium, convened by Byrne and Ockwell – to provide CRIBs training to 41 African and international climate policy makers [S7]. The training focused on equipping participants with the knowledge and capacity to advise their governments on using the CRIBs approach to leverage climate finance via the GCF and on using CRIBs to improve the implementation of climate technology policy in their respective countries.

18 African countries were represented at the AU training, including representation from: 14 African government ministries; four intergovernmental organisations, including the AU, World Bank, and African Development Bank; and 16 organisations with formal roles in advising and implementing national climate policy in their constituent countries [S7]. [text removed for publication] at the AU concluded that:

“CRIBs presents a paradigm shift for the participants in these processes as articulated in most of their comments in the evaluation after the meeting [AU CRIBs training event]. This methodology will open gateways for easy access to climate funds. The African Union continues to get more requests for continuation of similar trainings in different regions of the continent.” [S7, S8].

He also asserts that the training “triggered the development of the AU Green Innovation Framework” [S8], which helps member countries transition to green economies for sustainable development in line with AU’s Agenda 2063 – a plan for inclusive and sustainable development. The Green Innovation Framework, which builds directly on the CRIBs approach, is now complete, with a public launch expected in 2021 (having been delayed by COVID-19) [S9a & b].

4.3 National-level African climate policy impact

At a national level, as a result of the AU-commissioned CRIBs training and two further training and capacity-building programmes run by Sussex researchers with their partner ACTS, 16 policy organisations from nine different countries have now developed (or are developing) funding proposals to the GCF to implement CRIBs in their countries, or are using the CRIBs approach to inform climate policymaking and implementation processes [S7]. Both Kenya and Burundi have submitted CRIBs-based GCF funding proposals [S10]. To date, this has resulted in USD9.99 million in GCF funding to Burundi (leveraging USD21.73 million in match funding), with an estimated 573,500 beneficiaries [S12a & b]. Kenya also has two proposals at advanced stages of approval, worth a total of USD20 million [S12a]. This national-level uptake of the CRIBs approach represents a significant shift towards focusing policy and practice on building innovation systems around climate technologies based on understanding the context-specific needs and political realities of different countries and their people.

Kenya’s National Environment Trust Fund (NETFUND) supports the implementation of the AU’s action plans and is designated by the Ministry of Environment to apply for GCF funding. It has adopted the CRIBs approach in all programme design, as the research director explains:

“We have adopted this as the approach in developing ministerial projects and programmes... so far we have developed 12 programmes under this approach and they are under consideration for funding within government budgets... One of the concepts... was shared with GCF and they have sent back very positive comments... The concept was on supporting policy and regulation enforcement on GHG emission and air pollution control.” [S7, p13]

This funding proposal has since been submitted and is currently under its second round of review by the GCF [S10]. Similarly, Dr Kelvin Khisa, Head of the Kenya Industrial Research and Development Institute (a state corporation under the Kenyan Ministry of Industry, Trade and

Cooperatives) states that his organisation is “currently developing a GCF readiness proposal for Kenya on the development of energy efficiency regulations following the 4 CRIBs goals” [S7, p16].

In Uganda, Mildred Namwiira, economist at the Ministry of Water and Environment, states:

“We have really made progress after the CRIBS training and we have changed the way we think in terms of applying for GCF and AF [UNFCCC Adaptation Fund] funds. The theory of change that the CRIBs approach advocates for has improved our skills in writing bankable proposals. [We] are currently building on the knowledge I attained from the training to develop GCF and AF fundable proposals.” [S7, p15]

Further national-level examples from Ghana, Egypt, Tanzania, Zimbabwe, Botswana, Nigeria and Malawi are described in S7.

5. Sources to corroborate the impact

- S1** Email testimonial from [text removed for publication], asserting the CRIBs approach was the basis for the review and subsequent recommendations, adopted under the UNFCCC, for improving climate technology policy under the UNFCCC
- S2** UNFCCC policy document which, based on the CRIBs approach, frames future climate technology interventions under the UNFCCC as “innovation system builders” (2019) <https://undocs.org/en/FCCC/SBI/2019/7> (annotated PDF also supplied)
- S3** Email from UNFCCC Secretariat [text removed for publication] attesting to significance of the CRIBs approach to both UNFCCC technology policy and climate technology funding under the GCF
- S4** GCF policy document citing CRIBs as a mechanism through which climate technology research, development and deployment in developing countries will be funded and using the CRIBs approach to frame its analysis (2017) <https://www.greenclimate.fund/document/gcf-b18-12>
- S5** GCF policy document (2017) <https://www.greenclimate.fund/document/gcf-b18-12-add01>
- S6** Email from [text removed for publication] the World Bank
- S7** Evaluation report on African Union funded training on Climate Relevant Innovation-system Builders (CRIBs) approach for accessing GCF funding and improving climate technology policy and practice (2018) <https://www.arin-africa.org/wp-content/uploads/2020/11/AU-CRIBs-training-evaluation-report-final.pdf>
- S8** Email testimony from [text removed for publication] African Union
- S9 a)** Email confirmation that African Union Green Innovation Framework uses CRIBs and is to be launched in the first half of 2021, Dr Joanes Atela, Lead of High Level Panel for the development of the African Union Green Innovation Framework; **b)** <https://www.ash-net.org/dr-joanes-atela-appointed-to-a-high-level-panel-for-the-african-union-green-innovation-framework-au-gif/> (2019) confirms AU-GIF and role of CRIBs
- S10** Email confirmation CRIBs funding proposals for Kenya & Burundi submitted to GCF
- S11** World Bank InfoDev Climate Technology programme <https://www.infodev.org/climate>
- S12 a)** Email corroboration CRIBs funding awarded to Burundi and in final stage of review for Kenya; **b)** GCF website with Burundi project details (2020) <https://www.greenclimate.fund/project/sap017>