SETI

SUSTAINABLE
ENERGY
TRANSITIONS
INITIATIVE

SETI 2019 Conference Proceedings

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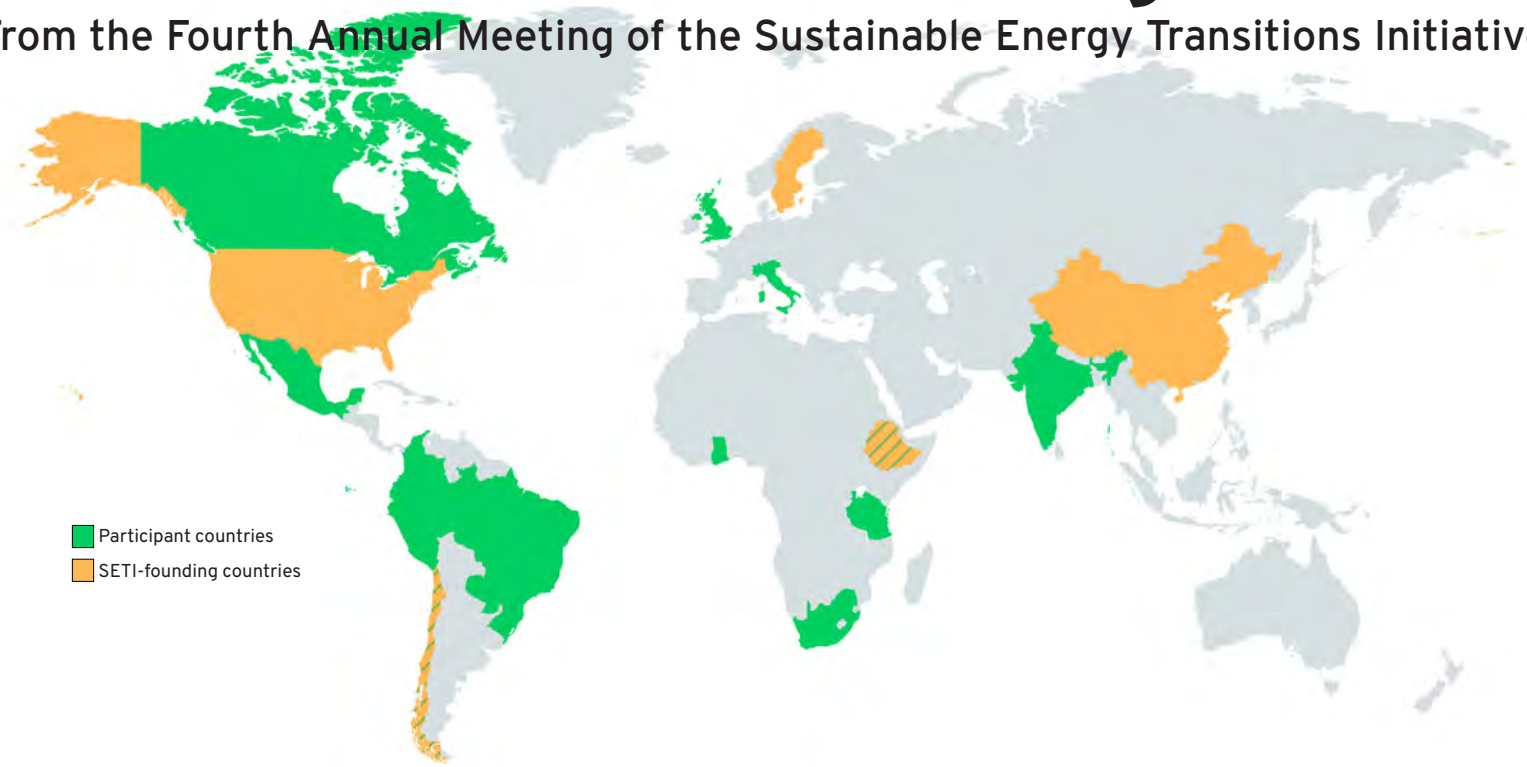
Conference Proceedings

From the Fourth Annual Meeting of the Sustainable Energy Transitions Initiative



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This spring researchers from across the world convened in Santiago, Chile for the 4th Annual Meeting of the Sustainable Energy Transitions Initiative from 15-17 May 2019. This was the first time that the spring conference was held outside Duke University (SETI's home institution), and this allowed the proceedings to focus on issues core to energy transitions in Latin America. Scholars shared their findings on LPG use in Ecuador, electric vehicles in Paraguay, and air pollution in Chile. The conference retained a strong international presence, however: Research was presented on fuel choice in India, willingness to pay for solar products in Ethiopia, and home heating in Beijing. That is to say, despite our assumptions about the relative development of Latin America compared to sub-Saharan Africa and Southeast Asia, the findings from the conference only highlighted how universal energy issues really are, even as they are situated in a local context.

Subhrendu Pattanayak, SETI co-founder, kicked off the first day of the workshop discussing the common trap of 'Type III errors.' These errors occur when research produces very precise answers to pointless questions. In an ongoing effort to avoid these errors and produce research that is both timely and policy-relevant, the papers presented at this workshop reflect these goals and build upon work presented at previous network convenings. This research complemented discussions and questions raised by policymakers and practitioners also in attendance during the workshop's policy day. These proceedings highlight the 7 key themes that emerged from this convergence.

1 Flawed proxies: clean cooking transitions about more than wealth and electricity

In Ghana, 51% of urban homes have an LPG cookstove, but 74% of those with an LPG stove said they used a charcoal stove the day before (Katherine Dickinson). So what is preventing household behavior change? Although a comprehensive, systematic review of nearly 80,000 papers by Duke researchers showed that 54% of quantitative energy studies in LMICs focus on cooking, including 31% of studies in sub-Saharan Africa (Sam Lwiza), the focus has been overwhelmingly on the relationship between cooking, health and air quality. At the conference, many researchers had taken up the work on cooking and moved forward, looking at the drivers of technology change and adoption.

Photo credit: Joanna B. Pinneo

Two key themes emerged. First, that our assumptions about the relationship between wealth, electrification and income are flawed. This is crucial because increased income is often associated with cleaner fuel use. In fact, Marc Jeuland found that higher income has a role in reducing the ill effects of energy poverty in South Africa.

However, Ridhima Gupta found that electrification in India actually leads to an increase in the probability of fuelwood adoption and a decrease in the adoption of LPG, potentially because the cost of electricity requires households to cut back on other energy-related expenses. Likewise, Anmol Soni found that wealth alone does not improve uptake, since greater land ownership can also dampen the relationship between income and LPG adoption. Wealth and electrification do not necessarily relate directly to income or uptake of these technologies.

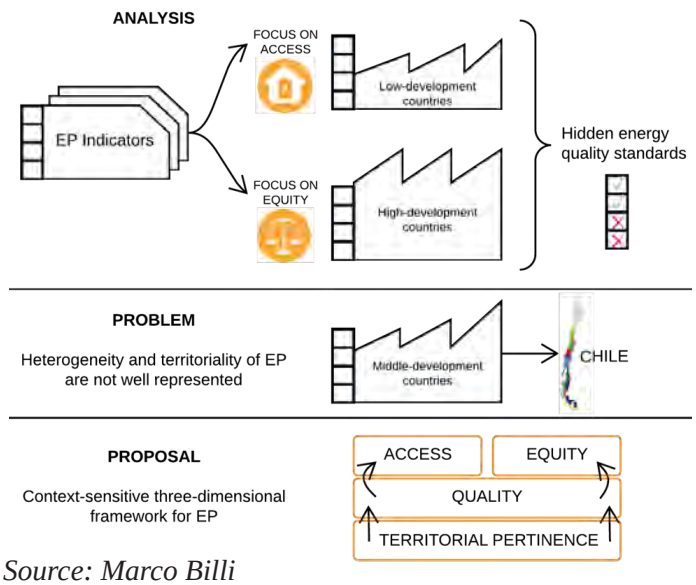
Second, behavior change is about more than money. It has a psychological component that needs to be brought into our research. Abhishek Kar outlined one potentially useful theory: the transtheoretical model of change, which suggests that the transition to clean technologies is a five step process that involves awareness, access and affordability at different steps along the way.

1. Target: exclusive use of traditional cooking solutions (TCS)
2. Intention: use of TCS with plan to use clean cooking solutions (CCS)
3. Uptake: access to CCS and purchase of CCS
4. Stacking: TCS is primary/dominant stove, while CCS is the secondary stove
5. Switching: CCS becomes the primary/dominant stove while TCS becomes the secondary stove

2 Bridging low- and high-income measures of energy poverty

Given that almost all the research in the conference related to Sustainable Development Goal (SDG) 7 – access to clean, affordable, sustainable and modern energy – it was surprising that it was difficult to land on a good definition of energy poverty. Was poverty a measure or access or a measure of affordability? Marco Billi pointed out that low-income countries are assessed on access whereas high-income countries consider energy poverty (EP) to be a function of the proportion of income spent on fuel or electricity. Chile, as a middle-income country with nearly 100% electricity access, finds itself between the access-based energy poverty indicators of low-income countries and the affordability-based indicators of high-income countries.

Marco Billi and Carlos Villalobos both tried to address the flaws in these definitions by proposing new approaches for defining energy poverty in Chile. Marco Billi created an index that combines both approaches, whereas Carlos Villalobos proposed a perception-based index that relies on customer perception of multiple dimensions. Both indices bridge this access vs affordability binary in an attempt to better map where energy poverty is still an issue. Without a precise and concise definition, it is challenging for governments to design and target interventions to those in need.

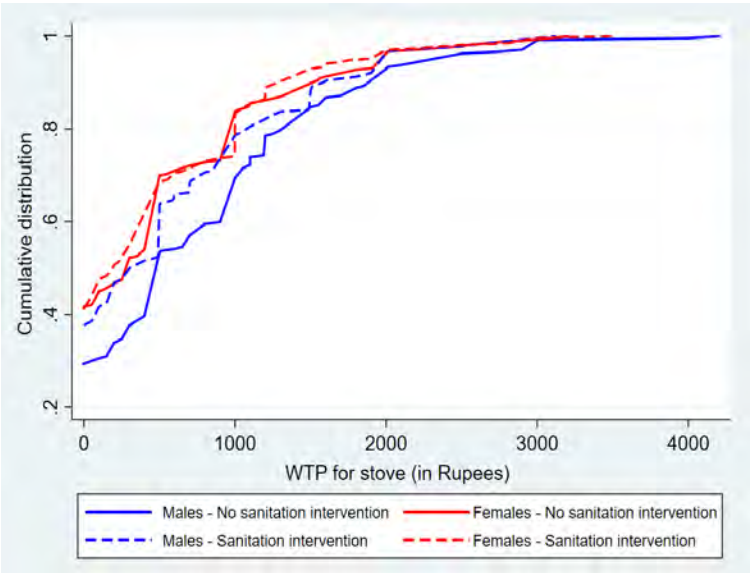


Source: Marco Billi

3 Gender impacts the response to cookstove interventions

Given that women are the primary users of cookstoves in most contexts, it has long been understood that clean cookstove adoption will primarily benefit women. However, several researchers at the conference explored how responses to interventions are also gendered. In African refugee settlements, while cookstove preferences are tightly linked to environmental factors, the impacts of those preferences on gender relations were based in cultural relationships to fuel. For instance, in Kakuma, Kenya, firewood is associated with women whereas charcoal is associated with men. Marta Talevi found that where charcoal fuel was used, men were more involved in the cooking process.

On the other end of the spectrum, P.P. Krishnapriya found that men in villages which had previously been introduced to a sanitation intervention were less inclined to pay for cookstoves than men from villages that had not been part of the sanitation intervention. Delving deeper, it became clear that it was those men from villages that had previously abandoned the sanitation intervention that were pulling down the average willingness to pay, whereas women from those same villages were relatively unaffected by past intervention failures. These insights are crucial for designing interventions that improve gender equity.



Source: P.P. Krishnapriya

4 Air pollution enters the political discourse in Chile

Air pollution in Chile rocketed into the news last year when the coastal town of Quintero suffered health problems due to a poisonous clouds that were attributed to nearby chemical plants, in addition to the coal-fired power plants and oil processing plants in the area. The high-profile nature of the problem has emboldened the Government of Chile, which is planning to phase out or reconvert existing coal plants in the coming years (Carolina Gomez). The first step in addressing the problem is measuring where air quality is lowest. Victor Caquilpan, from the Government of Chile's Superintendence of the Environment, showed the results of a low-cost monitoring system, which could be used to identify patterns of pollution in Santiago.

Urban air pollution costs Chile billions in health costs and mortality rates (Sebastian Miller & Cristobal Ruiz-Tagle), just as it does in other contexts. In China, exposure to ambient air pollution contributes to 500,000 yearly premature deaths (Ellison Carter). Across the globe, awareness of air pollution's detrimental effects has increased, and Duke researchers are in the process of measuring the willingness of households to pay for improved air quality in three major Asian cities (Beijing, China; New Delhi, India; and Jakarta, Indonesia). In translating the health impacts of pollution into financial costs and benefits, the hope is that cities and countries will wake up to the crisis at their doorsteps.

5 Even with political will, countries struggle to shift away from traditional fuels

Latin America has a high rate of firewood use for cooking and space heating, which contributes to air pollution, particularly in populated urban settings. Fuel stacking complicates the effectiveness of fuel policies, and policies that have sought to transition users to cleaner fuels have sometimes undermined one another (i.e. induction stove promotion undermined by continued LPG subsidy in Ecuador – Carlos Gould) and in other instances increased energy expenditure (i.e. firewood standards in Chile – René Reyes).

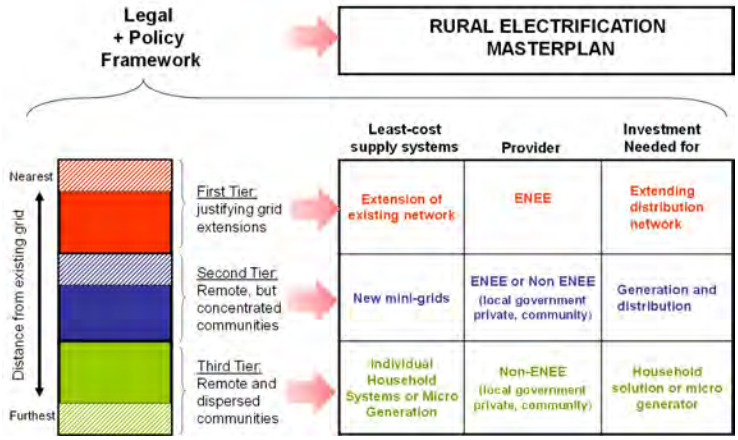
"URBAN AIR POLLUTION COSTS CHILE BILLIONS IN HEALTH COSTS AND MORTALITY RATES"

-Cristobal Ruiz-Tagle

Interestingly, some behavior-based interventions have been shown to reduce wood-stove pollution emissions by around 17%. In one trial, a strip of plastic was affixed above the damper setting for wood stoves, signaling that the more choked the woodstove, the higher the pollution emissions. The plastic strip cost $5 and reduced the frequency of the choked damper setting by 12.7%, which translated to a 17.3% reduction in pollution emissions (Alejandra Schueftan).

6 Expanding access or improving reliability? A difficult balance

In Latin America alone, $600 million will be required annually to reach last mile populations without access (Javier Cuervo). In Chile, which has an electrification rate nearing 100%, reaching the final unelectrified citizens involves a six-hour boat ride each way (Pablo Tello). Yet, despite the high electrification rates in the region, evidence suggests that country's are forgoing macro-economic benefits until universal electrification is achieved, especially where reliable electricity is lacking.



Source: Javier Cuervo

In Brazil, increased electrification was an important driver of structural change, accounting for 7% to 25% of the value added in the services sector (offset by a relative decline in the agricultural and manufacutring sectors) (Jevgenijs Steinbuks). Even in countries like Honduras, which has an electrification rate of 87.6%, two thirds of the population do not have reliable electricity, which impinges on development and is a problem that persists across OECD countries. These hidden challenges take a real, financial toll on the economy, as Emily Pakhtigian outlined in her talk on the energy access dividend, which quantifies the electrification benefits forgone over a country's business-as-usual electrification transition. This approach can provide guidance on the relative gains of extending electricity access versus improving access for those who already have it.

7 Political determinants of the efficacy of interventions

Duke's systematic review makes an appeal for more impact evaluations of novel policy interventions. Findings from the conference suggest that information campaigns and financial incentives both contribute to changing behaviors and technology adoption. However, the political economy of energy systems has a large role to play in the efficacy of such interventions.

Source: Robyn Meeks

Two speakers addressed "non-technical losses," a coy term for theft and corruption. In a trial of smart meters in Kyrgyzstan, Robyn Meeks and her team found that the increased accountability of smart metering increased monthly electricity bills, suggesting that previous bills were not accounting for all consumption. In a very different circumstance, Meera Mahadevan found that there was greater manipulation of electricity consumption data in Indian constituencies in which the state-wide incumbent party also had control at the assembly level. At this level, consumption was artificially lowered, reducing electricity bills for voters that supported the incumbent party. While voters see initial benefits, this puts strain on the utility, which must account for a higher actual consumption rate, potentially leading to increased blackouts. Whether non-technical losses are happening at a household level or through systematic manipulation, the cultural and political factors that influence them are crucial to the success of interventions.

Concluding remarks

Throughout the high caliber research at the conference, non-economic forces emerged as one of the biggest ongoing barriers to energy transition. Whether it was the psychological components of behavior change, the impact of flashpoint events shining a spotlight on air pollution, or the negative ramifications of political corruption, crafting policy is about more than finding a social optimum. The policy relevance of our research is the key contribution of this network, and we look forward to seeing the expansion of our research into new topics. Read more about the key takeaways from SETI's Policy Interaction Workshop in Santiago, here. SETI researchers will have another chance to convene this year at the upcoming EfD conference in Bogotá, Columbia from 22-25 November, 2019.

SETI
SUSTAINABLE ENERGY TRANSITIONS INITIATIVE

The Sustainable Energy Transitions Initiative (SETI) is an interdisciplinary global collaborative that aims to foster research on energy access and energy transitions in low- and middle-income countries and to better understand their impacts on health, social outcomes, economic growth, climate change, and natural resources. This "center without walls" is coordinated by Duke University faculty Subhrendu Pattanayak and Marc Jeuland and is sponsored by the Swedish International Development Cooperation Agency through the Environment for Development Network.

Duke
ENERGY ACCESS PROJECT

The Energy Access Project at Duke University is a new research and policy effort that aims to address the challenges around increasing access to modern energy solutions to underserved populations around the world. It takes an interdisciplinary approach to developing sustainable, modern energy for all. The Energy Access Project is working to provide policy makers, project developers, investors, civil society and impacted communities with the tools and analysis to help drive this transformation. Key Duke collaborators in this effort include the Nicholas Institute for Environmental Policy Solutions, the Duke University Energy Initiative, the Sanford School of Public Policy, Bass Connections, and the Nicholas School of the Environment.

PHOTO CREDITS

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