Articulating a sustainable future for India's energy system and the role of smart meters

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What are we doing ?

- We are investigating how the access to key essential energy & water services is being re-configured within metering technologies currently planned for & implemented in the rapidly growing cities in the Global South

- We are using Greater Mumbai in India as a case study

- The goal is to inform the implementation & use of energy & water metering in ways that encourage
    - social inclusion
    - environmentally sensitive consumption patterns
    - & reduce health inequalities

Why Meters ?

- Metering of consumption is essential to the efficient operation & planning of electricity & water networks

- Metering is often lacking or not fit for purpose in the Global South

- Leading national & international agencies & governments to encourage the introduction of 'smarter' more comprehensive metering in the water & electricity sectors

- Energy & water meters are gateway technologies that control access to energy & water which are being used to re-engineer the provision of electricity & water in the global south

- The choices of meters are not merely technical ones

Why Meters in India?

- The UN's SDG 3 'Good health & well-being' cannot be met in India or the rest of the Global South without universal access to electricity & water

- Without improved metering universal access to water & electricity can not be achieved which is essential to SDG3

- The question is what are impacts of the new forms of water & electricity metering on
  - the efficient use of limited resources
  - on formal & informal access to electricity & water
  - on inequalities in the health & well-being of the population in general & those living in poverty in particular

What is in a meter?

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Why Meters in India?

- In India new forms of electricity & water metering currently being planned &/or rolled out offer a radically new potential for controlling & reshaping the vast water & electricity infrastructures in India's rapidly expanding cities

  - India's national smart metering programme aims to replace 250 million conventional meters with smart meters. Energy Efficiency Services Limited (EESL)

  - The smart water meter market in India is forecast to grow at a CAGR of 14.7% during 2019-2025

What is in a meter?

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Engineering needs to be informed by social science

Organisational political & cultural factors influence the selection of different technical choices

Obduracy

Infrastructures are prevailing organisational political & cultural factors made 'concrete' & are therefore difficult to change !

Science & Technology Studies

- STS is focuses on how organisational political & cultural factors influence the process of technological development & innovation

Specifically we are concerned with

- How current organisational political & cultural factors are influencing the implementation of energy & water metering in the global south
- How the way in which new forms of energy & water metering being implemented in the global south impact on peoples access to essential services

Meters are not merely measuring devices

- There are multiple opportunities for the development of environmental & social applications within different metering systems including

  - Improving the efficiency of energy & water networks

  - Providing customers with cost & environmental messages through user displays

  - Providing more equitable access to scarce resources via telescopic tariffs

- The take-up of these potentials is strongly framed by the competing economic political & social priorities

STS enables an Interdisplianry approach

- Metering options are primarily viewed as purely technical choices & the impacts they may have on access to water & electricity provision are mostly overlooked

- To move beyond this our project draws on
  - Sociology
  - Electrical Engineering
  - Public Health

- The co- creation & co-production approach adopted in the research will build enduring research that can make a change at the population level

- To support this approach we have developed a research training programme for use by the project which is avialbe on YouTube

Three integrated work packages

1 Investigation of the technical infrastructure of electricity & water metering

- ✓ Explores
  - ✓ How electricity and water policy evolved in India with a focus on metering technology
  - ✓ How smart a smart meter needs to be in the context of India

2 Critical assessment of electricity & water metering infrastructure

- ✓ Interviews conducted with industry and policy stakeholders to explore how different socio-political affiliations impact on decision-making & technical choices in relation to metering infrastructure in India with a focus on Greater Mumbai

3 Understanding the impacts of the water & electricity metering infrastructure on communities

- ✓ Interviews conducted with householders to explore how deprivation & uneven access to energy & water impact on different socio-economic groups with a focus on Greater Mumbai

Water Supply India changing political/regulatory focus

Fallouts

Results

Supply driven approach
A need/resource (1950-2002)

Demand driven approach
A commodity (2002-Till date)

Demand driven approach
A commodity (upcoming)

No water supply at individual unit level. No focus on urban. Less focus in water quality monitoring.

India: world's largest user of ground water extraction through hand pumps and bore-wells

Lack of knowledge in water metering technology, feasibility, approaches.

Effects to be observed

1. 38.4% to 60.4% access to improved drinking water in rural areas from 1981 to 1991.
2. 75.1% to 81.4% access to improved drinking water in urban areas from 1981 to 1991.

1. 60.4% to 75.6% access to improved drinking water in rural areas from 1991 to 2001.
2. 81.4% to 90% access to improved drinking water in urban areas from 1991 to 2001.
3. Water supply source (65.4% within premise, 25.4% outside premise, 9.18% away from premise) till 2001.

1. 75.6% to 82.7% access to improved drinking water in rural areas from 2001 to 2011.
2. 90% to 91.4% access to improved drinking water in urban areas from 2001 to 2011.
3. Water supply source (71.2% within premise, 20.7% outside premise, 8% away from premise) till 2011.

Outcome only in terms of coverage

Expected outcome in terms of water saving percentage, water revenue through tariff, legal and illegal connections, and most importantly water quality

Interviews with industry stakeholders: Meters as Techno-fix

Metering is perceived as a solution to a host of managerial issues

- Using automated or smart meters improves bill collection

- 'De-coupling' of non-payment and disconnection of customers

- Facilitate smarter and fairer payment structures, e.g. telescopic tariff seen as possible but not the main focus

- Reduces losses on the distribution network for water and electricity

Interviews with industry & policy stakeholders: Establishing formality

Installing meters and smart meters for electricity formalises connections to services

- Puts in place payment tariffs that could mean lower bills for electricity

- Reduces inequitable metering practices by avoiding electricity sub-metering in informal settlements

"With sub-metering in informal housing, even the telescopic structure results in the renter paying more per kWhr than their landlord" [PE-E]

Interviews with industry & policy stakeholders: Changing 'services' culture

- Metering as a technology that can herald cultural change at the organisational level of DISCOMS and water authorities
  - With smarter meter, the way 'things are done' in water and electricity sector will improve
  - Help companies rid themselves of organisational practices that have normalised "negligence and a culture of disrespect" when dealing with customers [MS-E]

Interviews with industry& policy stakeholders emergence of 'responsible user'

- Shifting responsibility from state government for services to users of customers
  - Individual responsibility to pay for and provide services for their families or households
  - Upholding efficient and accountable institutional services for water and electricity that raise the country's status

Interviews with householders & Trust

Trust was at the heart of the successful functioning of metering and billing practises, particularly amongst lower socioeconomic groups, where shared meters and billing were more common.

Such factors involved not being able to check meter readings, or of (mis)trust of leaders, but also of trusting those with whom bills and meters were shared to use utilities responsibly

"it seems slum people are under the impression that if they have a tall meter, they're going to have to pay more(...) I think they are mis-informed by political leader, there is information also, people are afraid of their leader because they might be under a lot of ah, they have to survive". **MIG-002**

Interviews with householders & Societal Inequalities

Unequal access to utilities largely reflected wider societal inequalities.

These inequalities included difficulties in challenging or questioning bills for individuals by those who are not confident in their levels of literacy and numeracy, issues surrounding gender, to others who felt that utilities were part of a wider drive to displace marginalised communities.

"I can no longer read and understand an electricity bill. There are so many charges for various reasons and it all comes to a really huge amount" **LIG-004**

"Honestly, I don't have enough time to spent on it. If I have to spend a day on it, the money that I lose when I take leave from work will be more" **LIG-009**

Metering in India

Barriers

- Political meddling, esp. in informal neighbourhoods
- Resources are needed to tackle theft on the system beyond a techno-fix
- Lack of joined-up plans for poverty reduction that would reduce non-payment, informality and lack of access

Opportunities

- Increase in RET penetration and drive towards smart grids
- Facilitate self-generation (electricity) and ecological water management

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Future visions of energy metering & service provision

- New metering largely perceived to be a 'technical fix'
  - Ecological & environmental solutions side-lined
  - Providing more equitable access to scarce resources side lined because there is not a drive to implement them in informal settlements
- Shifting responsibility from state government for services to users of customers may largely embed wider societal inequalities in the new metering systems being designed and implemented in India

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Source: State joint venture to support smart meter rollout in India Smart Energy International Sept 18 2020

Conducting transdisciplinary research in India during a global pandemic

26th October 2022, Teesside University
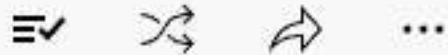**Room 2.11 The Curve, Middlesborough Campus and online**
Teesside University

Academics and researchers have had to adapt their research practices in the wake of the Covid-19 pandemic, especially in relation to fieldwork conducted abroad. The workshop is of interest to those seeking to inform their research approach from disciplines other than their own. It showcases the methods used and lessons learnt in our project funded by the British Academy, entitled *"What is in a meter? Working towards efficient, socially inclusive and environmentally sensitive energy and water infrastructures in the Global South."*

To Register for the workshop contact
E.Cuthbertson@tees.ac.uk
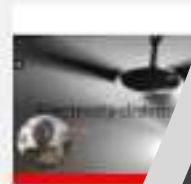
Online research Training programme on YouTube

https://www.youtube.com/playlist?list=PLyWcNrkrm05WuISjcnRs39rrG09xEDMhw

What is in a Meter? Research Training