



Kyoto University
Institute of Advanced Energy

ELECTRIFICATION IN SOUTH EAST ASIA: AGENDAS ON THE SOCIAL DIMENSIONS

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Presentation flow

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1. *Introduction*

- Electrification • Social effects • South East Asia
- Academic literature • Gaps

2. *Case studies (quality of life)*

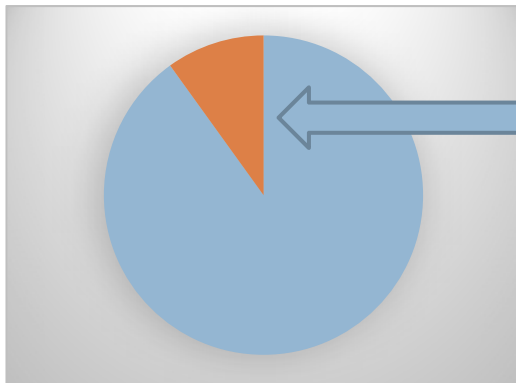
- Methods
- Findings
- Challenges

3. *Agendas*

How many people lack of electricity?

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- Around 850 million people worldwide do NOT have access to electricity

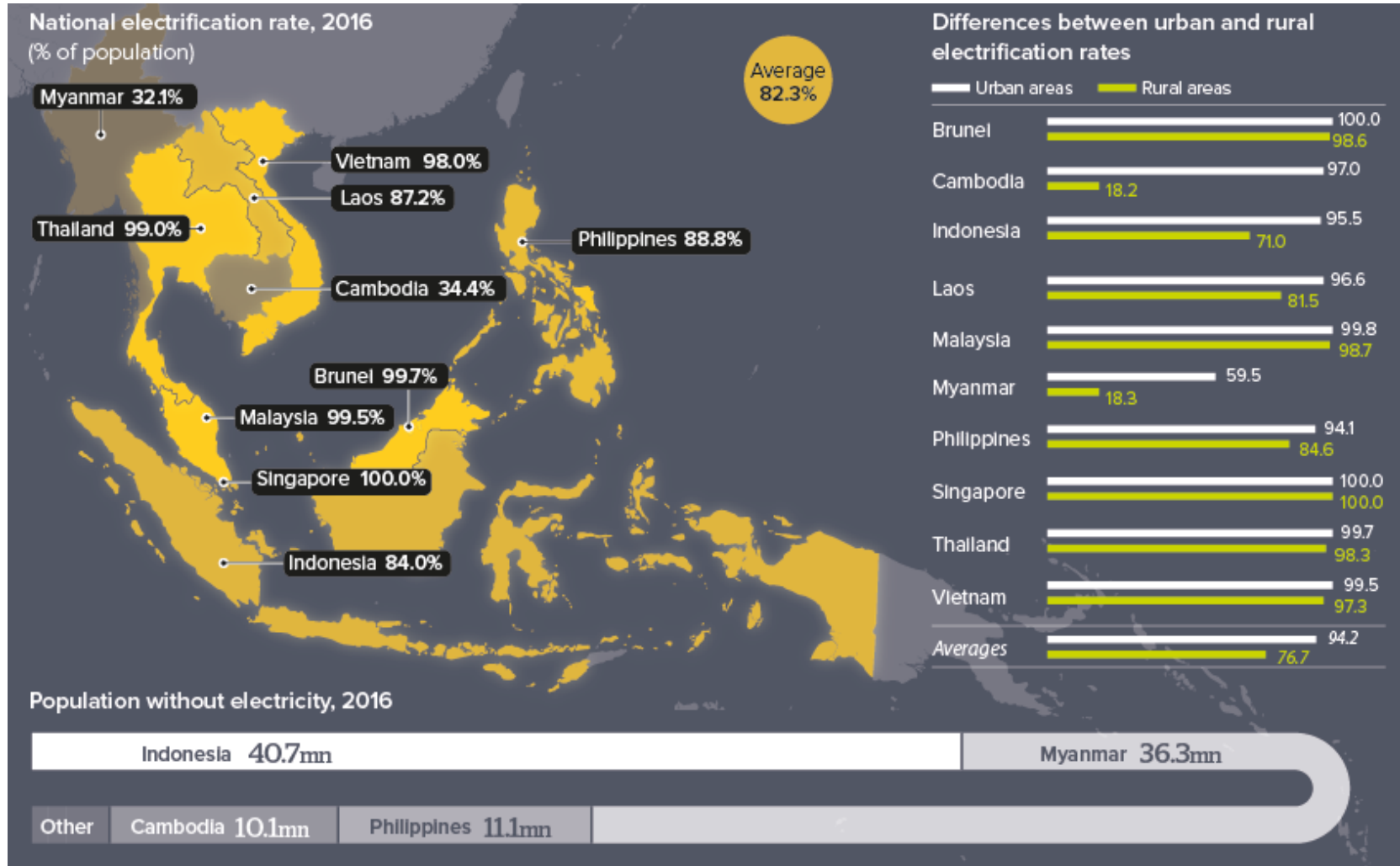


11% of 7.7 billions (2019)

- Most live in *rural areas of developing countries*

Electrification in South East (SE) Asia

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<https://dailybrief.oxan.com/Analysis/GA220581/Uneven-electrification-will-affect-ASEAN-competition>

Recent rural electrification (RE) studies

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- Mostly focused on economic, technology, or institutional issues
- Less emphasis on social effects/implications
- Concentration on S. Asia and Africa

Article	Focus point	Setting
Palit (2011)	Finance, institutions and governance	South Asia
Dinkelman (2011)	Employment, productivity, migration	South Africa
Schillebeeckx (2012)	Electrification business models	Review
Riva et al. (2018)	Economic impacts	Review
Khandker et al. (2012)	Income, expenditure, poverty, schooling (infants)	India
Kooijman-van Dijk & Clancy (2014)	Production, financial capital	Tanzania
Winther (2015)	Gender (women's empowerment)	Africa
Winther (2015)	Impacts on living condition (household structures)	Mozambique, Tanzania, India

SE Asia in the literature

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- Substantially fewer studies
- Persistent less focus on social implications/effects

Article	Focus point	Setting
Martin & Sustanto (2011)	Productive uses	Lao PDR
Bhattacharyya (2013)	Preferred systems	Indonesia, Philippines, Thailand, Vietnam
Van Gevelt et al (2017)	Productive uses, operation models	Malaysia
Al Faruq et al (2016)	Challenges	Indonesia
Saing (2017)	Household consumption and children education	Cambodia

RE effects & SDGs

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RE positive effects:

- *Energy services' access* - Universal energy (SDG7)
- *Pumps* - Improve water access and sanitation (SDG6)
- *Refrigeration, cooling, heating* - Improve health (SDG3)
- *Lights* - Improve children's education (SDG4)
- *Time* - Better opportunities to reduce gender gap (SDG5)
- *Diversify activities, increase productivity, higher incomes* - No poverty (SDG1), decent work/economic growth (SDG8)

RE negative impacts:

- Threaten local practices and culture
- Increase inequalities
- Create environmental and land rights controversies, etc.

Problem

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- Solid knowledge about:
 - ▣ Economic effects (income, productivity, etc.)
 - ▣ Technology options and applications
 - ▣ Institutional effectiveness
- Less so for social effects, because...
 - ▣ Effects are highly contextual
 - ▣ Several factors involved
 - ▣ Usually more difficult to examine
- Information on SE Asia is limited
 - Myanmar and Cambodia critical contexts, Indonesia/Phillipines (by population)
- *What aspects are in the social effects' agenda?*

Purpose

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- Summarise a research agenda on key social issues in connection with rural electrification (RE) in SE Asia
 - ▣ Presenting findings on electrification effects using quality of life (QoL) domains
 - ▣ Discussing limitations and challenges

Full details in:

- Cravioto et al. (2020) *The effects of rural electrification on quality of life: A Southeast Asian perspective*. *Energies*, 13, 2410

Quality of life (QoL) measures

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Quantitative categories:

1) Objective QoL indicators (more common)

- ▣ Infant mortality rate, life expectancy, mean years of schooling, gross domestic product, gross national income, water access, etc.

2) Subjective QoL indicators

- ▣ Self-reported quality of life, satisfaction levels, self-reported health, psychological well-being, social relations, aspirations, activities, etc.

QoL quantitative measurement

No.	Category	Dimensions	Domains	Items	Type of Variable
I	Demographics	-	(1) Gender, (2) age, (3) education, (4) family type, (5) occupation	5	Nominal
II	Quality of Life	Quality of life (Self-reported and satisfaction sub-domains)	Self-reported quality of life	1	Ordinal (10p scale)
			Satisfaction sub-domains: (1) Time use, (2) time alone, (3) housing, (4) cooking, (5) personal safety	5	Ordinal (5p-likert scale)
			Psychological well-being	1	Ordinal (5p-likert scale)
			Physical health well-being	1	Ordinal (5p-likert scale)
			Social well-being	1	Ordinal (5p-likert scale)
		Economic well-being	(1) Feelings about personal wealth, (2) regularity of lack of money preventing activities, (3) income	3	Ordinal (5/4p scale)/Scale
III	Occupations	-	Satisfaction with (1) main activity, (2) hours of work	2	Ordinal (5p-likert scale)/Scale
IV	Time of activities	-	Total active time	1	Time scale

5p likert Scale: very unsatisfied (1) – very satisfied (5)

Elements from the Wisconsin Quality of Life Index (Diamond, 1999)

Scales of analysis

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Different scales involved

- Household (individuals)
- Community (households, local authorities)
- Municipal (communities, two level of authorities)
- Etc.

RE-QoL Methodology

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1. Villages selection:
 - No electrification, similar conditions
 - Community willingness to take part in the project
2. Electrification scheme selection based on:
 - Economic capacity in the project
 - Geographical features of location and proximity to grid
3. Surveys (QoL questionnaire):
 - Prior (baseline) and after (endpoint) electrification
4. Post-collection analysis:
 - Use statistical methods to reveal differences between stages.

Locations

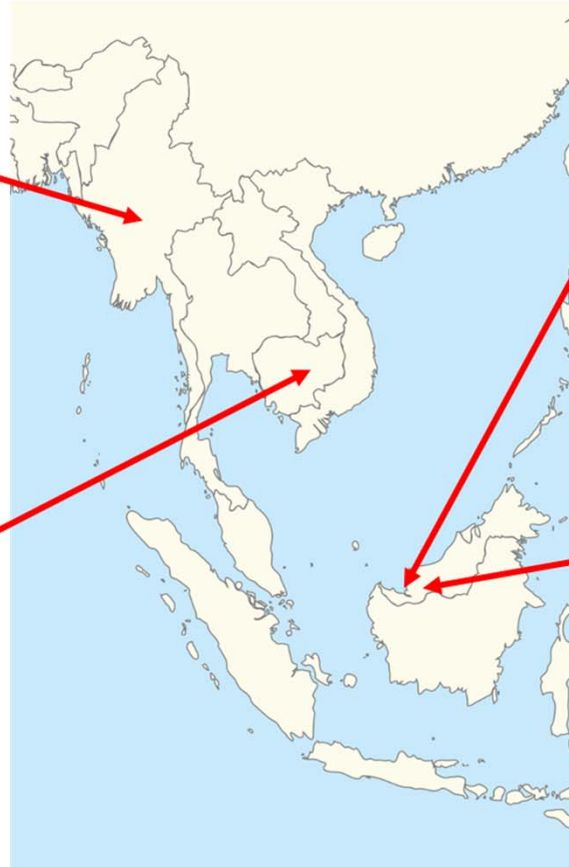
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Oak Pho, Myanmar



Thmor Keo, Cambodia



**Kampung Sungai Merah,
Malaysia**



Menangkin, Malaysia

- Income levels below national average
- Similar economic activities (mostly farming and fishing)
- Similar climate (tropical typical of the South-east Asian region)

Schemes and surveys

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Electrification schemes

Centralised – Grid Hybrid (PV+diesel)
Individual – Solar Home (PV)



Surveys

+1 year after

Electrification Scheme	Village	Country	Demographics	Cultural profile	Surveys	
					Baseline	Endpoint
Grid Extension	Menangkin	Malaysia	22 households (~100 inhab.)	Iban	n=19 (Apr 2016)	n=12 (18m after)
	Thmor Keo	Cambodia	215 households	Khmer	n=17 (Mar 2017)	n=21 (13m after)
Hybrid system	Oak Pho	Myanmar	400 households (~2000 inhab.)	Bamar	n= 19 (Nov 2017)	n=35 (15m after)
Solar Home System	Kampung Sungai Merah	Malaysia	5 households (~20 inhab.)	Iban	n=6 (Dec 2016)	n=7 (17m after)

Data analysis methods

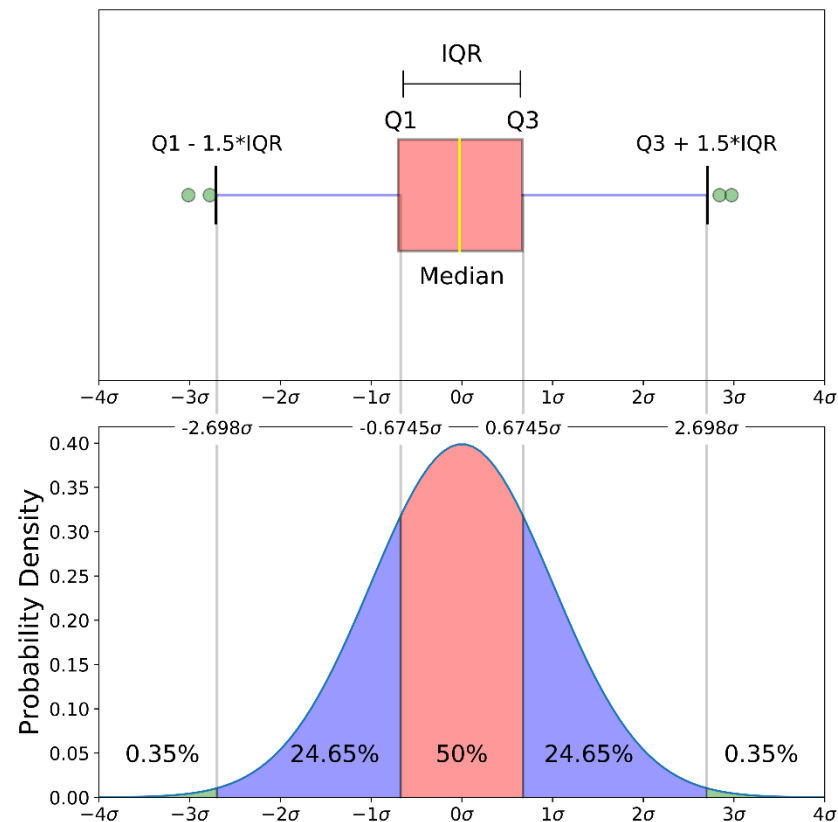
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A. Boxplot analysis

B. Statistical testing

- ▣ Median tests

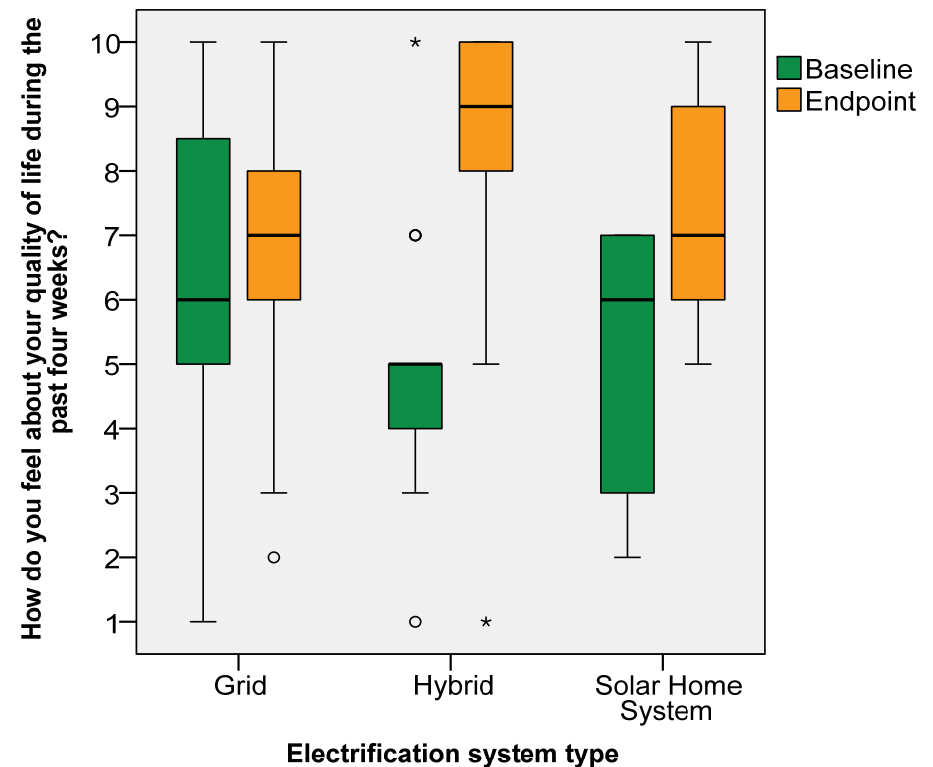
- ▣ Correlations



QoL & Domains (Self-reported well-being)

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- Self-reported well-being: integral evaluation of conditions
 - ▣ RE expands energy services for daily life
 - Cultural/leisure activities, productivity, communication, cooking/preservation food, sanitation.
- **Finding: Increase after electrification**



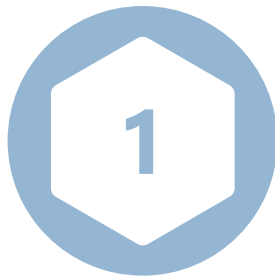
Median test: $X^2 = 13.1, p < .05$

QoL Domains

HOUSING

Satisfaction with housing

- **Finding: No change after electrification**



TIME USE / ALONE

Satisfaction with time spent, spent alone

- **Finding: No change after electrification**
- Weak correlations between self-reported QoL and both measures ($r_s = 0.36$, $p < 0.05$ for overall time use and $r_s = 0.069$, $p = 0.438$ for time alone)



COOKING

Satisfaction with the food consumed

- **Finding: Slight increase after electrification (Grid)**

SAFETY

Positive feelings about personal safety

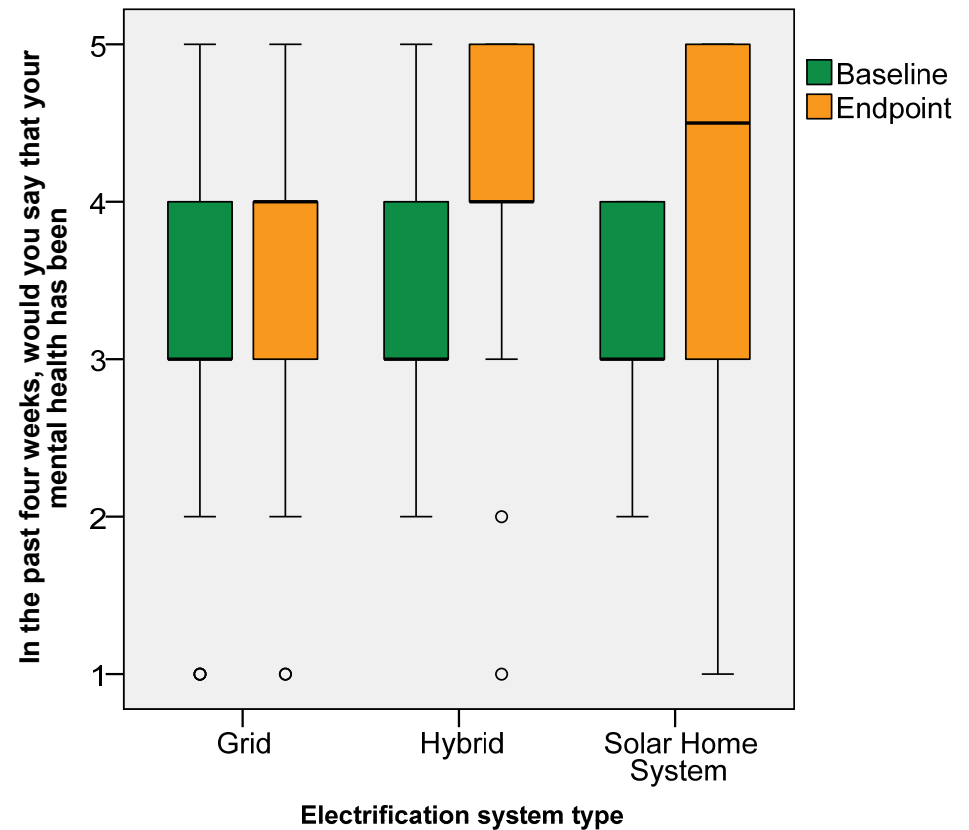
- **Finding: Slight increase (Grid / Solar Home)**



Psychological well-being

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- RE positive for self-valuations of mental health?
 - ▣ Due to increased gatherings, recreation time and activities
- **Finding: Increase after electrification**



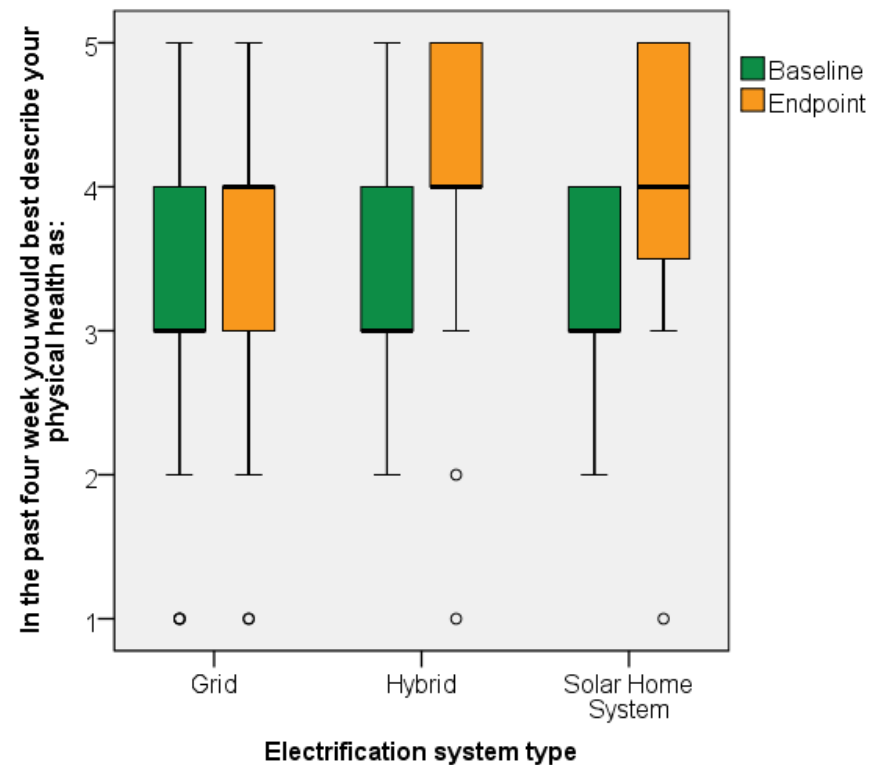
Physical health

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- Would RE increase own perception about physical health?

- **Finding: Increase without apparent direct effect**

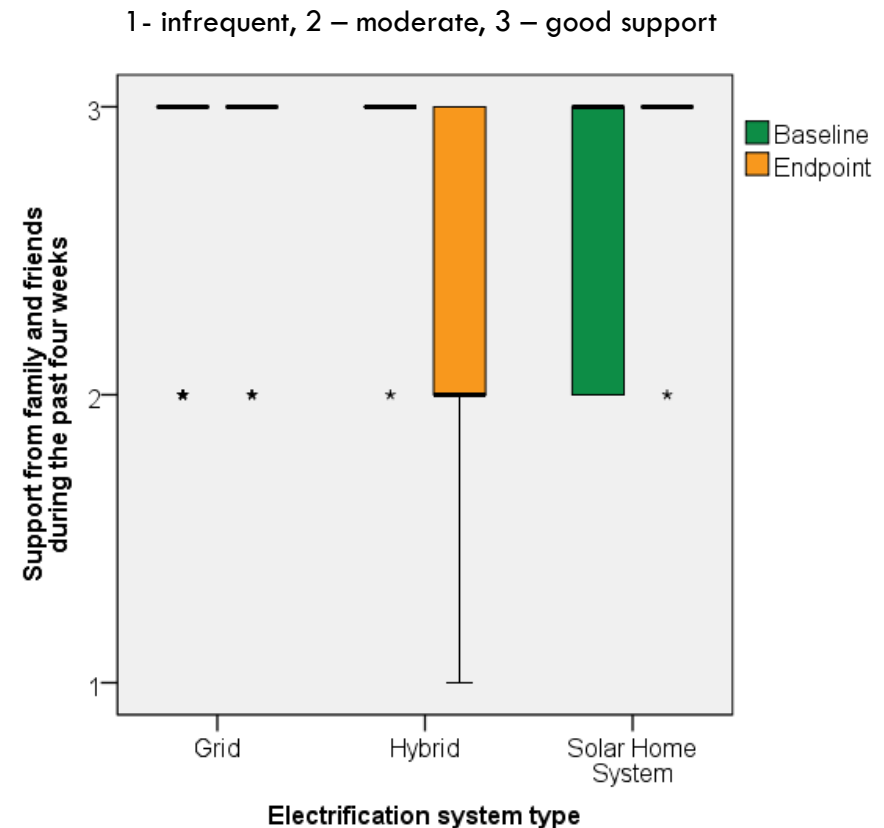
*No use of refrigerators to preserve medicines
Herbs and traditional medicines are the preferred way of curing illness or injuries*



Social well-being

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- Would RE change social interactions with friends and family and feelings towards support received from others?
- **Finding: No change**
 - Electrification exert little influence on family support
 - Migration and longer spans are worth analysing



Economic well-being

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- Would RE increase income and perceptions about it?
- **Finding: RE imposes minimal economic burden**
- **Substantially reduces household expenses for those using diesel generators**
- **This is consequential in satisfaction with money earned**

Scheme	Village	Country	Electricity Expenses	ΔIncome% after Electrification	Income Change (Perception)	Satisfaction with Money Owned
Grid Extension	Menangkin	Malaysia	↓	From 30% to 3%–7%	↓	No change
	Thmor Keo	Cambodia	↑	From 1% to 5%–6%	↑	↑
Hybrid system	Oak Pho	Myanmar	↑	From 0% to 1%	No change	No change
Solar Home System	Kampung Sungai Merah	Malaysia	↓	From 20% to 4%	↑	↑

Summary

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- Observed a positive effect of electrification on QoL
- Through different QoL domains, positive and neutral effects
 - ▣ Notably, for ways of spending time and housing, there was no visible effect
 - ▣ No change in social well-being
- Overall, the results reflect short-term effects

Challenges – RE and QoL

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- Complexity in the analysis:
 - ▣ Paths in the RE-QoL nexus? (cultural context)
- Careful examination
 - ▣ Look into people priorities
- Communal nature of social interaction
 - ▣ Family life: objects form part of social life?
 - ▣ Collective systems (systems of exchange of things / energy services)

Challenges – Analysis frameworks



On the framework of RE research:

- ❑ Human nature (universals/commonalities) vs differences (singularities/conflict)
- ❑ Untouched vs constructed community environment
- ❑ Developmentalist vs Natural embeddedness (Anthropocene)
- ❑ Symbiosis vs competition relations
- ❑ Mini-theories (risk of bias)

Challenges - Methodologies

On RE research conditions:

- High dependency on informants/collaborators (local language, community contact)
- Cultural bias (from informants/researchers)
- Limitations for remote interaction (no electricity, limited contact)

On RE methods:

- Differences-in-differences (larger samples, longer)
- In-depth interview/ focus groups (active local collaboration)
- Immersion & field notes (limited by pandemic)
 - ▣ Grounded theory approach

RE Social Agendas

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- Deeper understanding of social domains
 - ▣ What has changed in daily life
- Explore cultural meanings in detail
 - ▣ Understand underlying explanations of outcomes
- Explore other lenses
 - ▣ RE effects greater among groups: gender relations, family types, occupations, etc.
 - ▣ The role of other stakeholders
- Longer spans of observation

Thank you
for your attention



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