

Study on Social Impacts of Rural Electrification in ASEAN

Hideaki Ohgaki^a, Hang Seng Che^b, Jordi Cravioto^c, Satoru Kobayashi^a, Hla Toe^d, Bun Long^e,
Etu Ou Daya^e, Chia Kwang Tan², Nasrudin Abd Rahim^b, Hooman Farzeneh^f

^aKyoto University, Kyoto, 611-0011 Japan

^bUMPEDAC, University of Malaya, Kuala Lumpur, 59990 Malaysia

^cRitsumeikan University, Shiga 525-8577 Japan

^dPyay University, Bago 08156, Myanmar

^eInstitute of Technology of Cambodia, Phnom Penh, Cambodia

^fKyushu University, Fukuoka, 816-8580, Japan

¹Present address: Yangon University, Kamayut Township 11041, Yangon, Myanmar



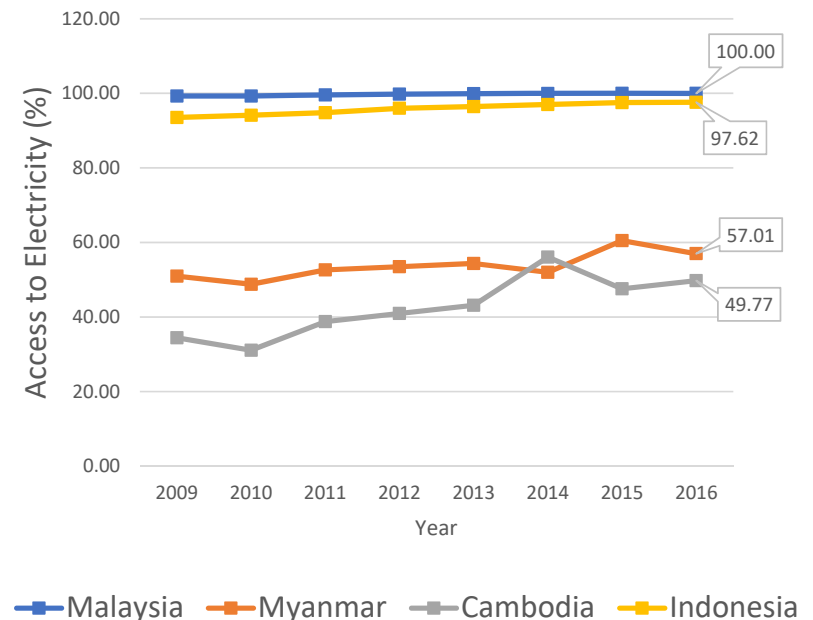
Background

Southeast Asia (SEA): Fast growing economic region

Still significant portion of the populations not electrified

Ongoing efforts on the electrifications of rural communities to **increase villagers' QoL**

- ⇒ Renewable Energy (Solar PV), grid extension
- ⇒ Unclear benefit, especially micro level
- ⇒ How to measure the benefits?
 - ⇒ Objective social index, subjective well-being



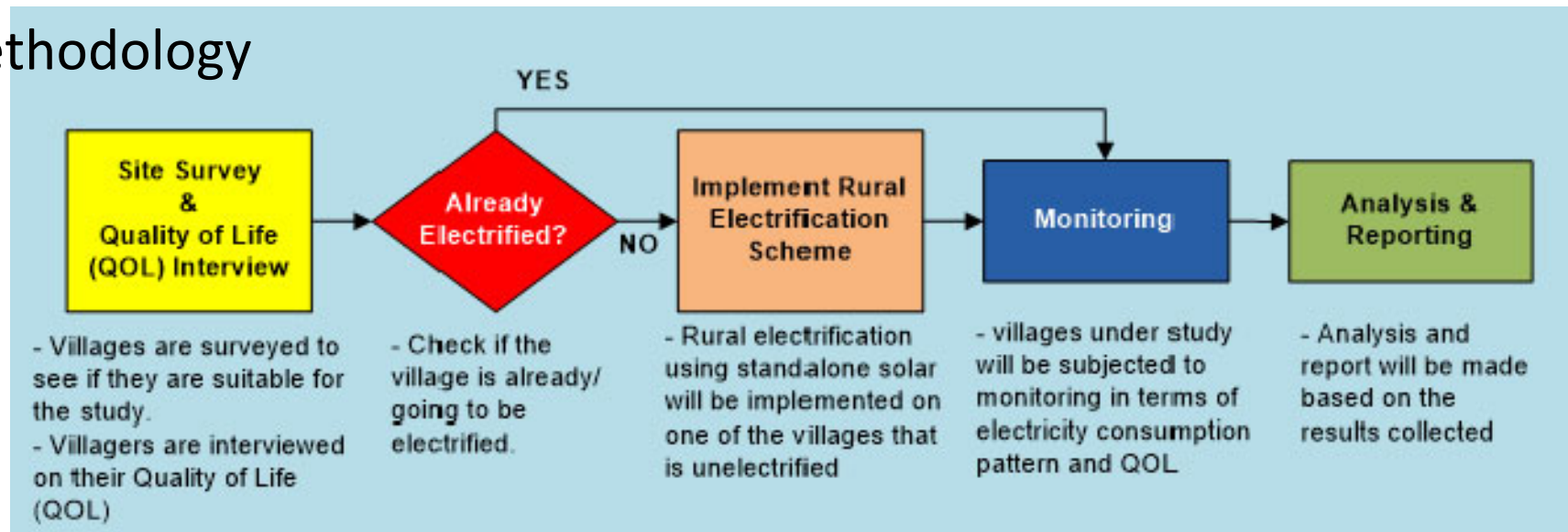
Reference [1]

Objective

Study on the impacts of different rural electrification schemes on QoL

- based on “before-and-after” interview data
- using objective indicators and subjective QoL
- different rural electrification schemes
(grid extension, solar home system, centralized solar system)

Methodology

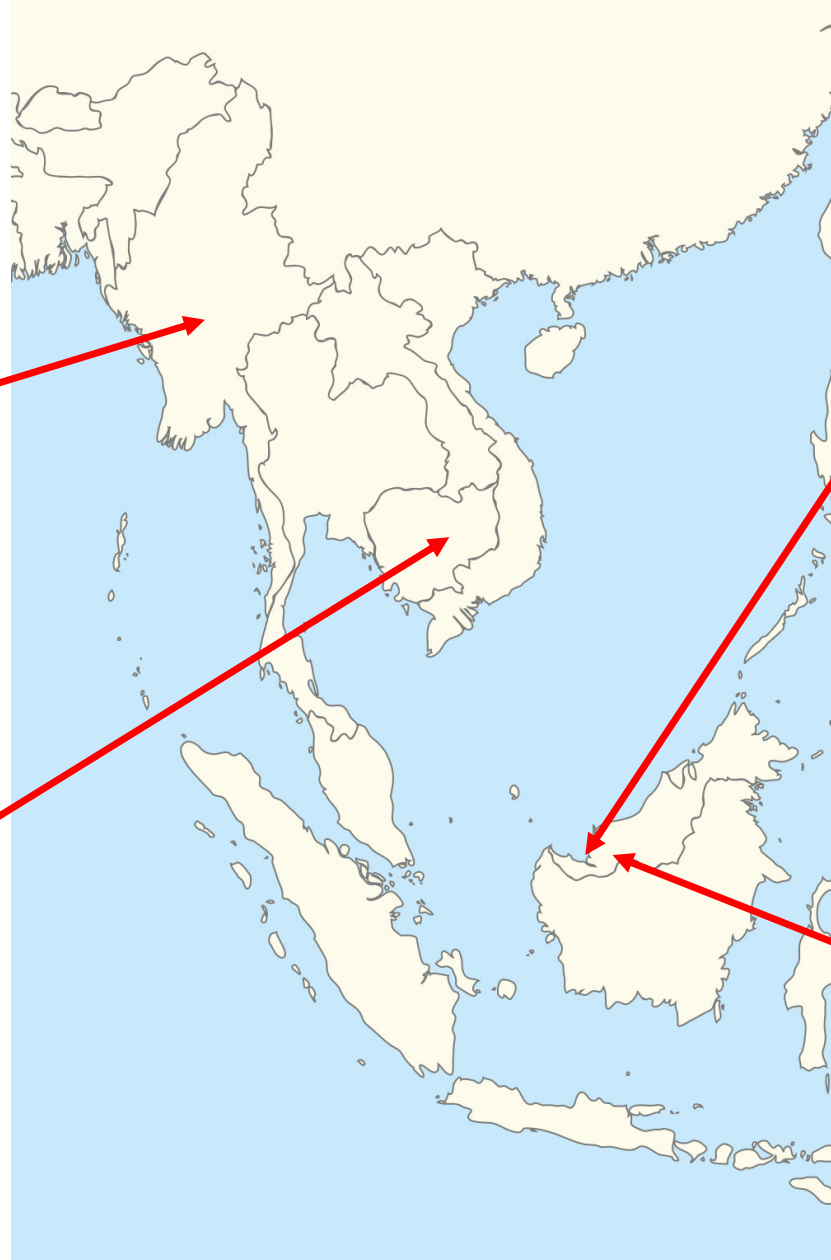


Survey sites

Oak Pho, Myanmar



Thmor Keo, Cambodia



Kampung Sungai Merah, Malaysia



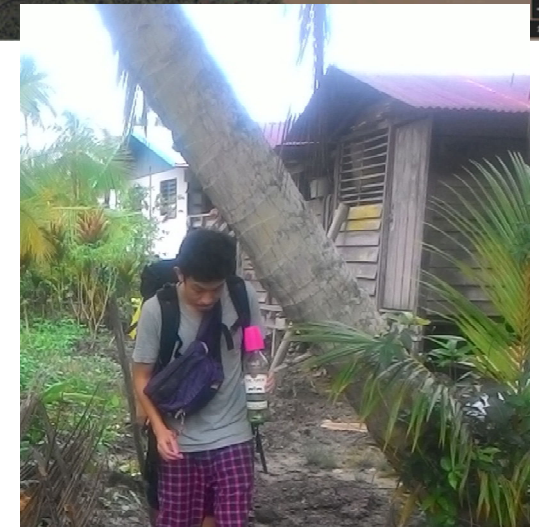
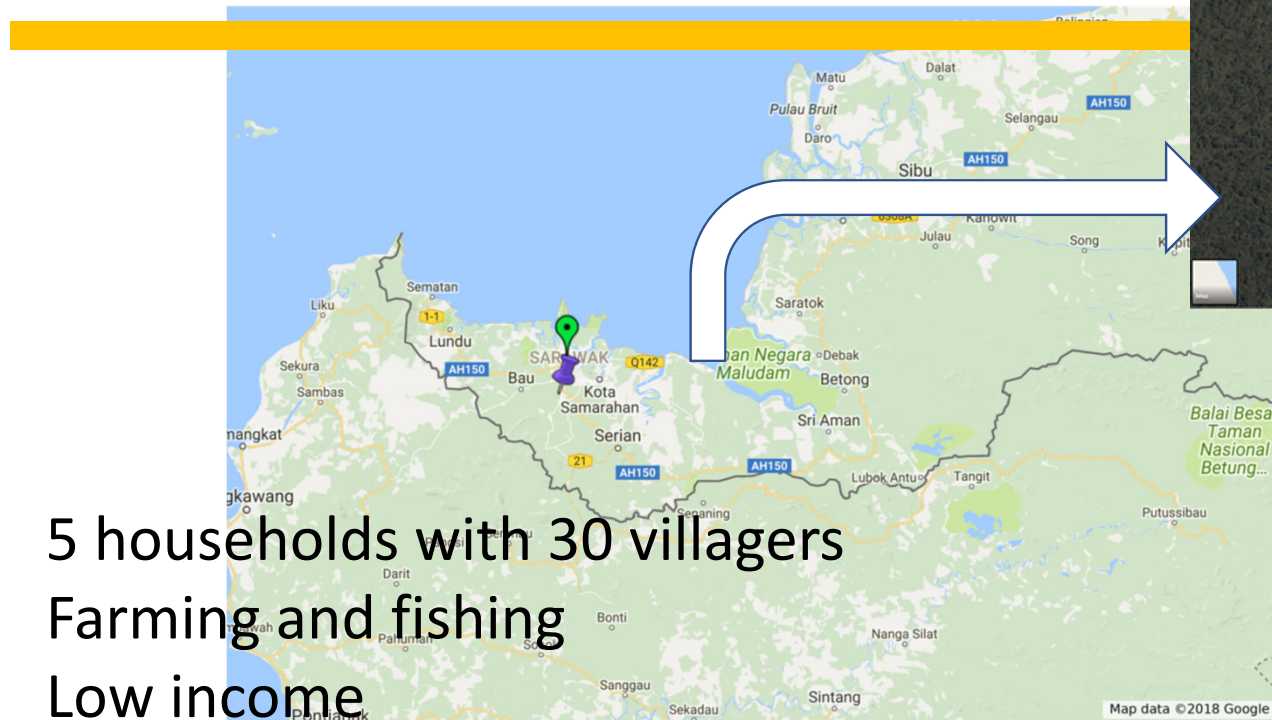
Menangkin, Malaysia



Table I: Rural Electrification Sites and Survey Details

Village	Country	Cultural profile	Demographic	Electrification Scheme	Survey
Kampung Sungai Merah	Malaysia	Iban	5 HHs (20 inhab.) Farmers	Solar Home System	Before: 6 HHs After(~17 months): 5 HHs
Menangkin		Iban	22 HHs (100 inhab.) Farmers	Grid Extension	Before: 19 HHs After(~18 months): 12 HHS
Oak Pho	Myanmar	Barmar	400 HHs (2000 inhab.) Farmers	Centralized Solar System (hybrid mini-grid)	4 months after : 19 HHs
					After(~15 months): 35 HHs
Thmor Keo	Cambodia	Khmer	215 HHs (1200 inhab.) Farmers	Grid Extension	Before: 17 HHs
					After(~13months): 21 HHs

Kampung Sungai Merah



1. 5 households with 30 villagers
2. Farming and fishing
3. Low income
- 3. Willing to pay for electricity**

Agrees to collect 30 RM/m/house for battery replacement

Installed SHS in Kampung Sungai Merah

5 SHS systems have been installed in **Feb. 2017**.

~6,000 USD / 5 systems

Item	Unit Specifications
PV Panel	305W, $V_{mpp} = 37.8 \text{ V}$, $I_{mpp} = 8.34 \text{ A}$, $V_{oc} = 45 \text{ V}$, $I_{sc} = 8.85 \text{ A}$
Battery	AGM sealed lead-acid battery, 12V, 150Ah
Inverter	Stand-alone type, 200W, Input: 12/24 V, 20/10 A _{max} Output; 230V 50Hz
Solar charge controller	PWM-type 12/24 V, 20/10 A

UM and JASTIP budget



Feb. 2017

Menangkin (before grid connection, 2016) ⁹



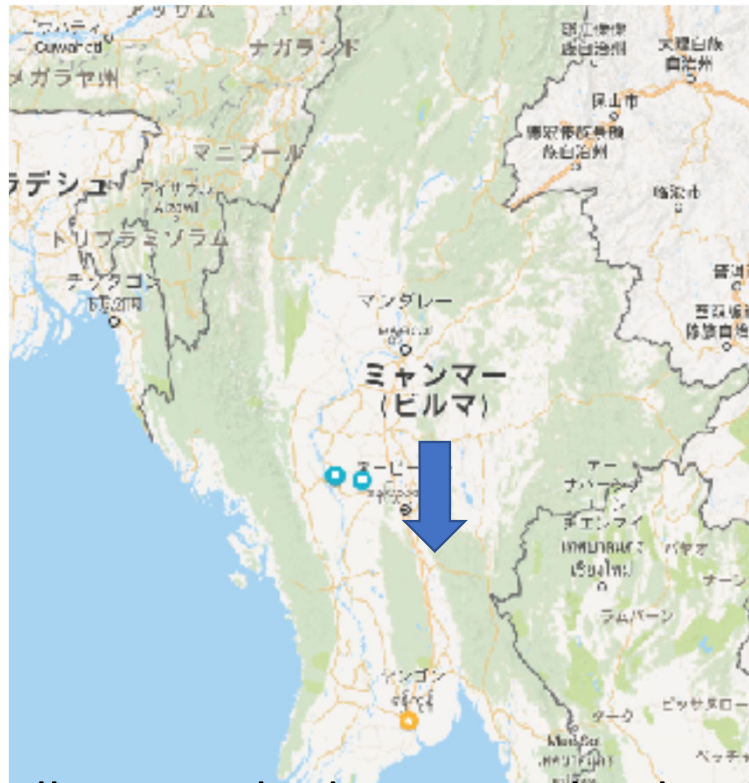
Grid power has been extended in 2017.
Interview was done in July 2018.

After (2018) 11 households interviewed



Myanmar case : Oak Pho Village mini-grid project

21



Interviewed 1 village, 25 villagers

- Village was built 2007 with school (elementary, branch of middle school), temple
- ~400 Houses, population ~ 2,000
- Road construction : 2012
- **Mini-grid installation : 2017.07**



20 kW Solar Plant

Power House

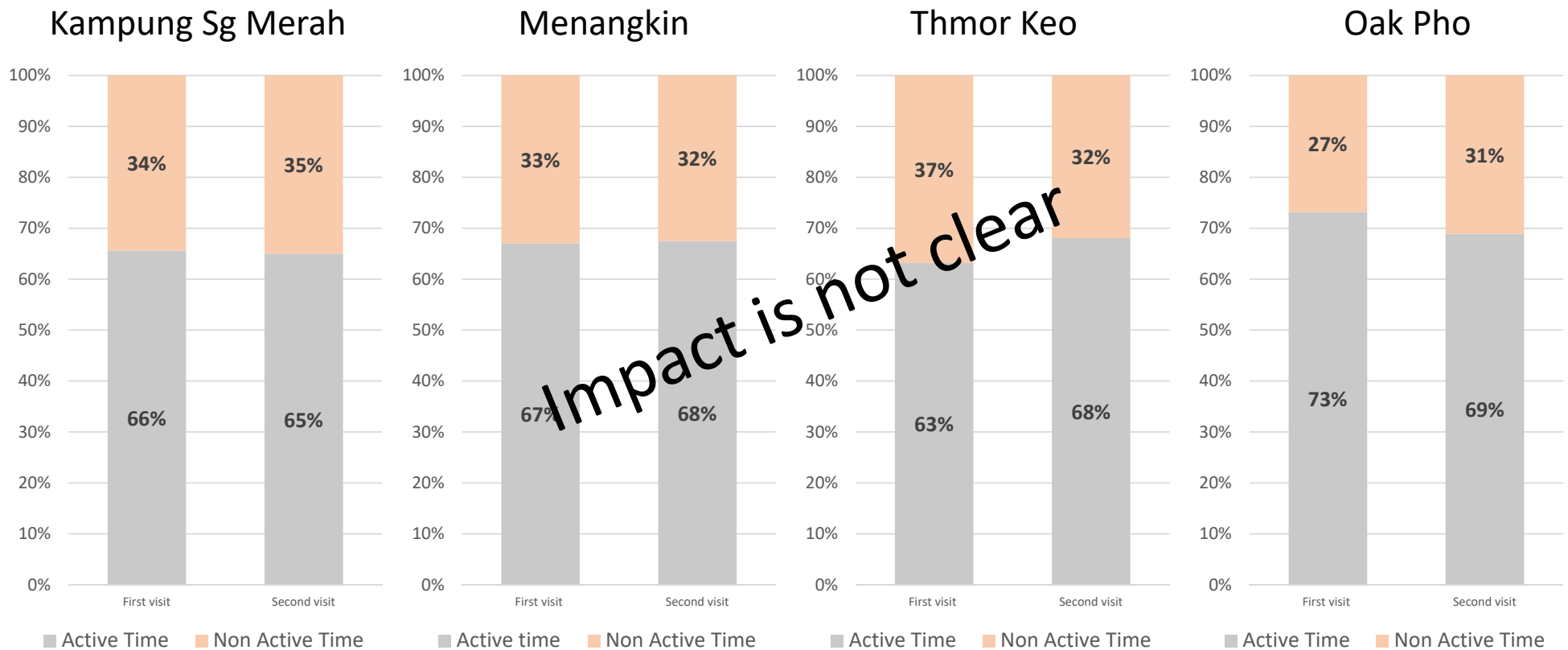


Interview sessions in Oak Pho

- 2017/11/12: 18 households (include 3 without mini-grid)
- 2018/10/20: 35 households (include 5 without mini-grid)
 - 2018 without mini-grid data is used as “Before” installation
- Age from 24 to 76, male/female ~50/50
- >90% low level education



Result: Active/Non-Active Time usage



Quality of Life Survey

Classified into two categories:

1) Objective social indicators (more common)

infant mortality rate, life expectancy, mean years of schooling, gross domestic product, gross national income and water access

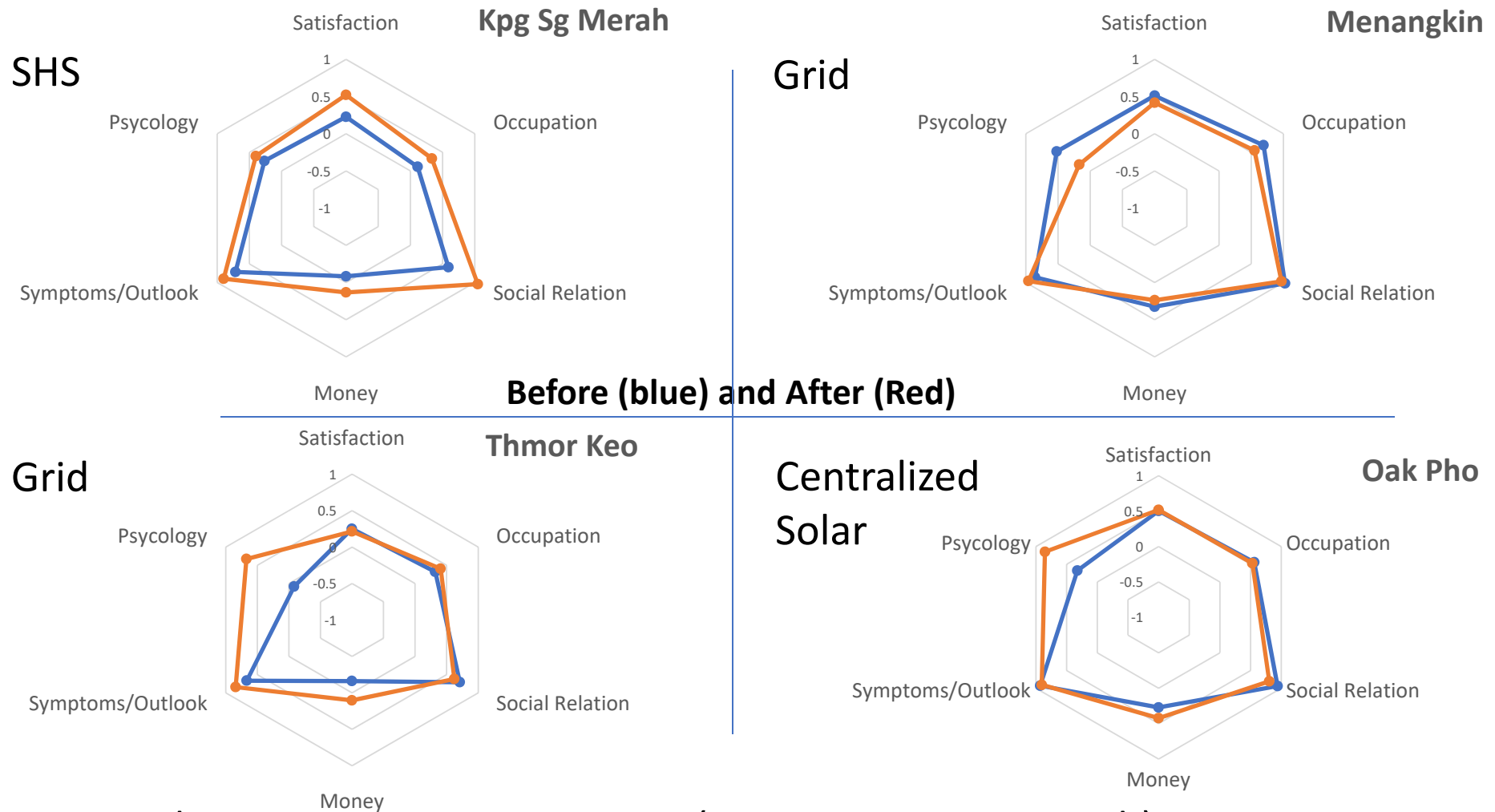
2) Subjective well-beings

*We focus on the **Subjective Well-being Aspects of QoL.***

QoL Index (QoLI)

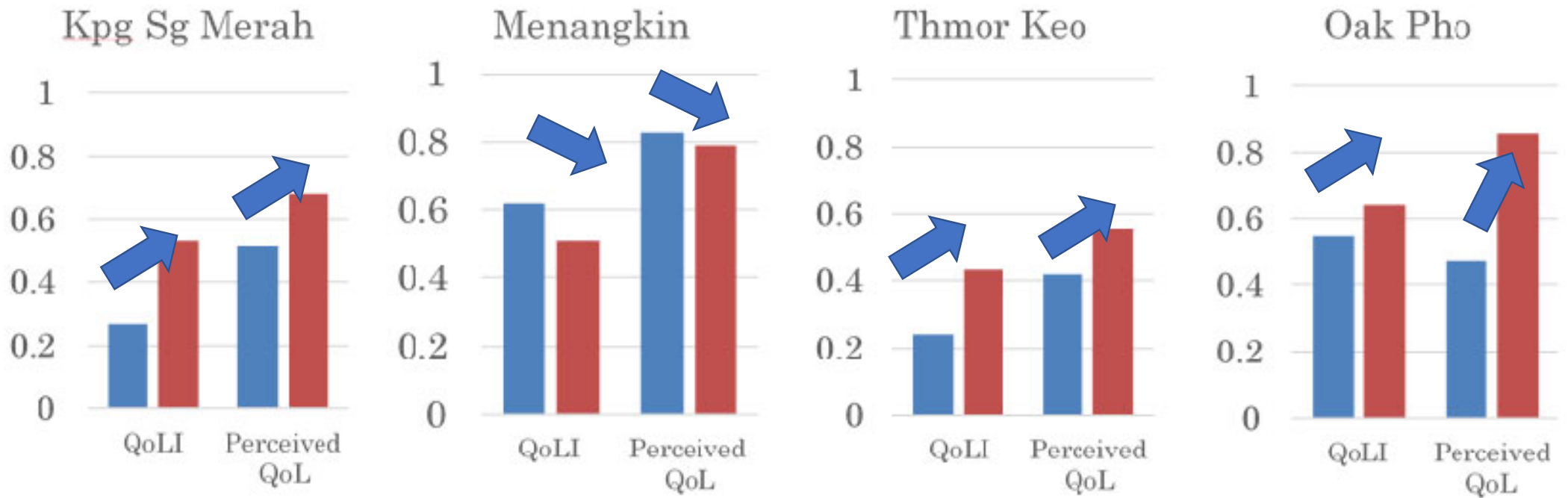
The calculation of QoLI here follows the similar procedures of the Wisconsin Quality of Life Index coding method [2].

Result: Breakdown of six domains of QoLI



- Highest QoL improvement: SHS (Kampung Sungai Merah)

Result: QoLI and Perceived QoL



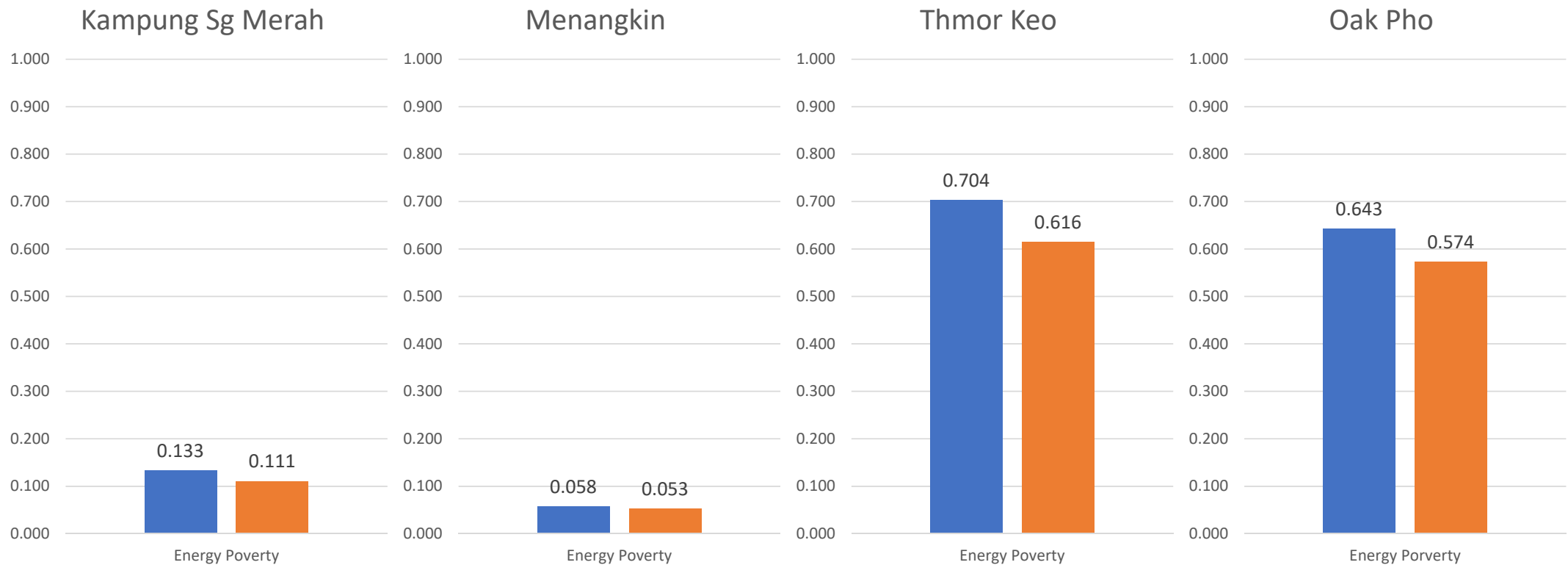
- QoLI shows the same trend as perceived QoL
=> QoLI reflects the subjective well being felt by the villagers
- Positive changes in most of villages, but drop in Menangkin

Discussion: Multidimensional Energy Poverty Index (MEPI)

Reference [3,4]

Energy Service	Indicator	Condition to be considered	Weight
Cooking	Modern cooking fuel	Using any fuel besides electricity, LPG, kerosene, natural gas or biogas	0.2
	Indoor pollution	Food cooked on stove or open fire (no hood/chimney) if using fuel beside electricity, LPG, natural gas or biogas	0.2
Lighting	Electricity access	Does not have access to electricity	0.2
Service provided by household appliances	Household appliances ownership	Does not have a fridge	0.13
Entertainment / Education	Appliances ownership	Does not have a radio / television	0.13
Communication	Telecommunication means	Does not have a phone land line / a mobile phone	0.13

Result: MEPI



- Improvement in MEPI in all schemes
- MEPI condition before electrification is important.

Conclusions (short term result)

- Study on the impacts of rural electrification on the quality of life in Malaysia, Cambodia, and Myanmar by multidimensional approach
- Different rural electrification schemes, “grid extension”, “centralized solar system” and “solar home system” with before and after interview sessions.
- Data analysis: QoLI
- No meaningful difference of the impacts on the communities’ quality of life between three electrification schemes.
- The energy poverty level of the villagers could play essential roles on the effect of any electrification scheme.

On going survey

- Cambodia
 - Grid extension sites: Thmor Keo, Kong Meas
 - SHS sites: 2019
- Myanmar
 - Mini-Grid sites: Byat Kaley, Nwah Chan Khone
- Indonesia
 - SHS and centralized solar: Pamekasan regency (East Java)
 - Different financial mechanism
- Philippines
 - SHS site: Rawang community
 - 2019: in collaboration with local NGO
- Thailand
 - SHS: Akha upland community in Mae Salong Nai, Chiang Rai (2014)

Acknowledgements

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