



Energising Development (EnDev) Indonesia

Micro-hydro power (MHP) in Indonesia

Sustainability considerations



Project Overview

- To provide technical support to the implementation of about **130 MHPs**
- To provide technical support to the implementation of about **117 solar PV mini-grids (15kW)**
- To undertake Village Management **trainings** on system operation, administration and maintenance
- To **monitor and evaluate** performance of rural energy infrastructure
- **Time frame:** 2009 - 2014





- **Sustainability measures**



Key Performance Indicator (KPI) surveys

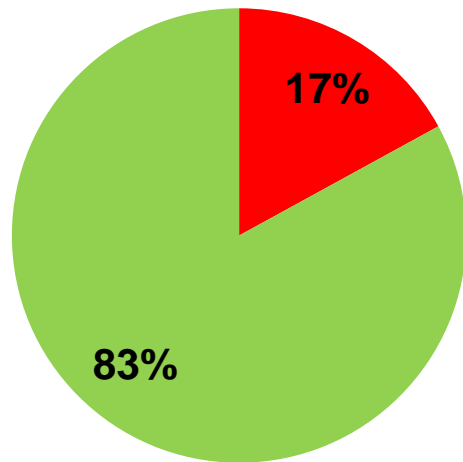
- A comprehensive, tested and refined survey tool (data capture, entry and analysis) for sustainability monitoring
- A technical, social, economic and environmental assessment for MHP sites after minimum 6 months operation





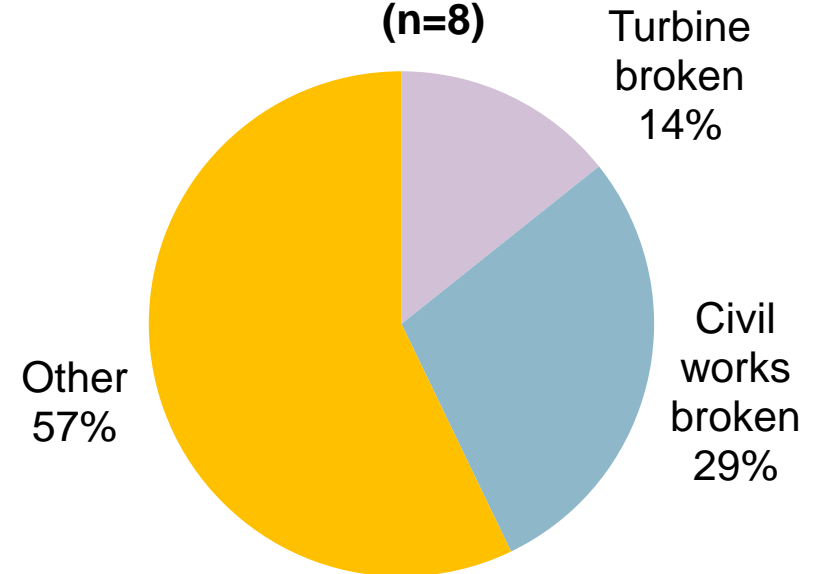
KPI - System breakages

**Percentage of Inactive MHP Sites -
EnDev KPI Survey 2012
(n=47)**



- Sites that don't have Electricity at the moment:
- Sites that have Electricity at the moment:

**Occurrence of Inactive MHP
Reasons - EnDev KPI Survey
2012
(n=8)**

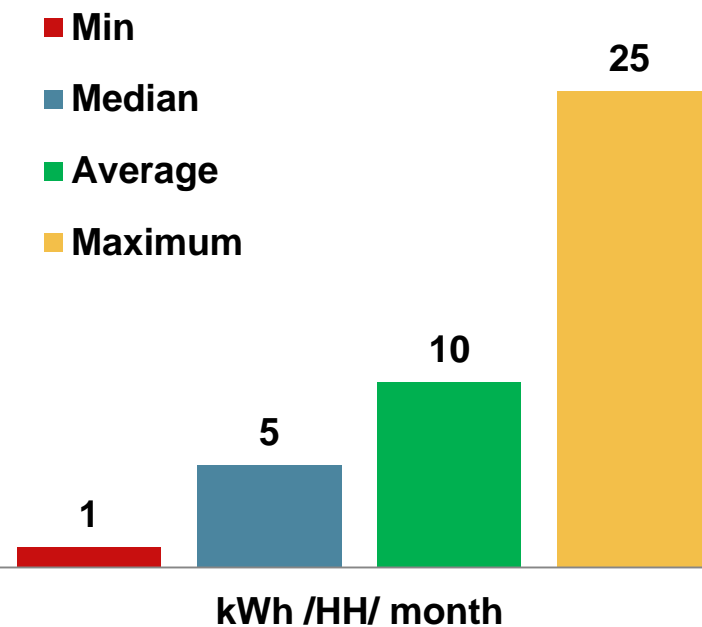


- 8 sites not active during KPI survey mostly due to force majeure.
- All 8 sites operational again 1 month later
- Oldest inactive site operated for 391 days, youngest inactive site for 45 days;
- Oldest active site has been operational for 656 days, and youngest active site for 39 days.

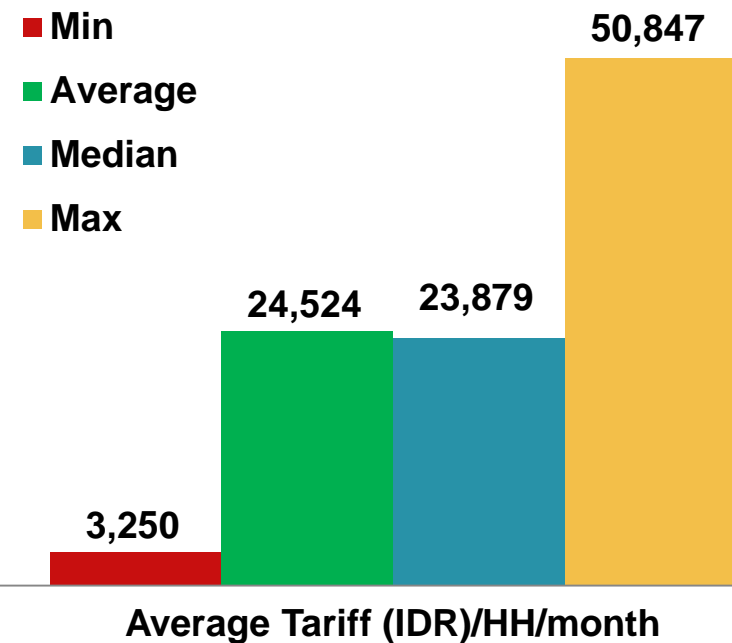


KPI - Energy consumption and expenditure

Consumed kWh per month per connected HH (n=19) – September 2012



Tariff fee per HH (n=19) - September 2012

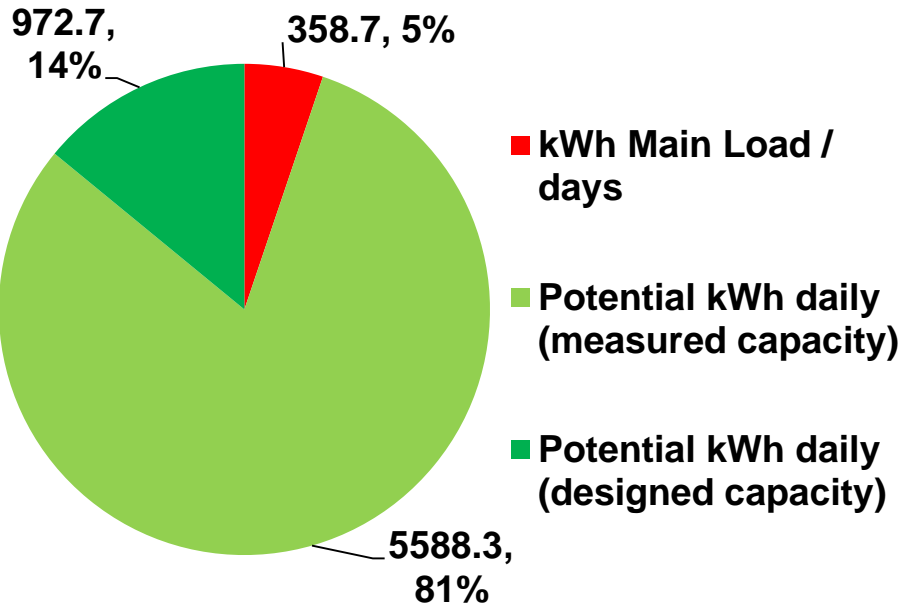


- Considering average consumption and expenditure, rural communities pay about 100% higher electricity tariffs

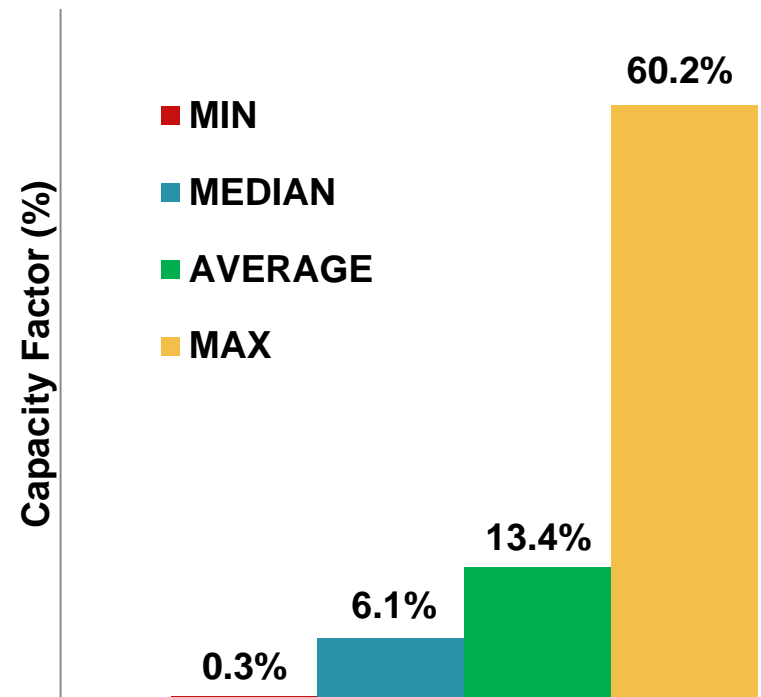


KPI- MHP cost effectiveness

Proportion of Electricity supplied to village vs Total potential kWh (n=19) - September 2012



Capacity Factor (n=19) - September 2012



- With about 80% of MHP potential electricity not utilised, there is significant scope to increase power demand by household and PUE appliances



MHP village support

- Comprehensive training modules with capacitated trainers for village management committee trainings supported by user-friendly guides
- BReIDGE: An SMS-based platform for MHP performance monitoring (technical and administration) and community feed-back



BRIDGE
Communication Bridge for Renewable Energy in Indonesia

Kode PLTMH: _____

<p>Konsumsi Listrik Lihat jumlah konsumsi listrik pada kWh meter di rumah pembangkit <u>Kirim SMS (contoh):</u> KONSUMSI (spesi) 5698 <angka yang tertulis di kWh meter></p>	<p>Jam Operasional Lihat jumlah jam pada panel kontrol <u>Kirim sms : (contoh)</u> JAM (spesi) 75689 <angka yang tertulis pada panel kontrol></p>	<p>Komentar Kirrimkan pertanyaan, komentar, berita mengenai PLTMH Bepak/libu ke nomor HP yang tertera di bawah <u>Kirim sms : (contoh)</u> Kode PLTMH (spesi) Pertanyaan/ Senang/ Keluhan</p>
<p>Operator Jika terjadi kerusakan <u>Kirim sms : (contoh)</u> Kerusakan (spesi) <kerusakan yang terjadi> Kerusakan</p>	<p>Bendahara/Sekretaris Jumlah rumah yang tersambung listrik PLTMH <u>Kirim sms : (contoh)</u> Sumbangan (spesi) 200 <jumlah sumbangan PLTMH> Sumbangan</p>	<p>Masyarakat Kabarkan tiap bulan : 1. Total pemasukan tiap bulan (PEMASUKAN) ; 2. Total biaya pemeliharaan (PEMELIHARAAN) ; 3. Total gaji pengelola (GAJI) <u>Kirim sms : (contoh)</u> Pemasukan/Pemeliharaan/Gaji (spesi) 1000000 <jumlah pemasukan/pemeliharaan/ Total Gaji pengelola PLTMH> Keuangan</p>

SMS tentang PLTMH ke : 0811 1465 112



PUE support

- Applied research in cost-benefit assessment of PUE initiatives through promotion of off-the-shelf electrical appliances
- Investigation into revolving loan facility for rural businesses in cooperation with NGOs and MHP management





PUE study results - Assumptions

- PUE will **strengthen** the sustainability of community-based **MHPs** by expanding the revenue potential (increased electricity sales) and improving overall MHP cost effectiveness (optimisation of capacity factor)
- PUE appliances will **improve** production and **income** and reduce work load and overall expenditure of rural businesses
- Numerous small-scale, **off-the-shelf appliances** spread across several businesses are more cost effective and less technically vulnerable than single specialised/customised large appliance.



- **Study conducted in 53 rural businesses, using 112 electrical appliances, in 9 villages in Indonesia (Sulawesi and Sumatera) over 6 month period**



PUE study results – Appliance performance

Business	Electrical appliances
Blacksmith	Metal grinder, blower
Bread-making	Blender, mixer, sealer/laminator
Carpentry	Hand drill, sander, planer, trimmer, circular saw, metal grinder, compressor
Coffee grinding	Coffee grinder
Egg hatchery	Egg incubator
Rice milling	Rice huller
Tailor	Sewing machine, embroidery machine, lockstitch machine, seaming machine desk light
Warung (Kiosk)	Oven, freezer, water dispenser, blender, rice cooker, food mixer
Workshop	Compressor, bench drill, arc welder, metal grinder

- Only specialised appliances (10W egg hatchery and 1.5 kW rice huller) failed
- Average cost of appliance Euro 83
- Average power demand 533 Watts



PUE study results – Business performance

- 72% of businesses made a profit
- Group-operated businesses increased monthly profit by 20% to 40% compared to baseline (3-month prior profit)
- Businesses that relied on specialised equipment made a loss
- Individual-operated businesses performance varied considerably according to entrepreneur skill, market access and business size
- Community-operated businesses made a loss (was considered “community service”)





PUE study results – MHP performance

Description	Sumatra						Sulawesi		
	Lembah Derita	IMPP	Paninjauan	Paninggiran Bawah	Wonorejo	Sungai Keruh	Salumokanan	Tawalian Timur	Tandung
Income collected from households (EUR/month)	76	40	200	60	320	480	120	48	52
Income collected from PUE (EUR/month)	No special tariff for PUE applied. The business owners pay only the household tariff.						20	14	14
Total expenses for salary and maintenance (EUR/month)	36	21	182	46	92	300	88	25	36
Number of connections	22	42	99	28	139	70	90	51	70
Difference (%) pre- and post-PUE in MHP profit	0%	0%	0%	0%	0%	0%	+63%	+60%	+88%

- In Sulawesi the average 5 businesses per village, increased profit for MHP operation by 60% and more (increased total turn-over by 17%- 29%)



<http://endev-indonesia.or.id>