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# **Overcoming Barriers to Renewable Energy Technology Acculturation in Indonesia**

*Off-grid PV & Hybrid Case Studies*

Maria Retnanestri

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Email: [m.retnanestri@unsw.edu.au](mailto:m.retnanestri@unsw.edu.au), [retnanestri@gmail.com](mailto:retnanestri@gmail.com)  
<http://www.ceem.unsw.edu.au/staff/maria-retnanestri>

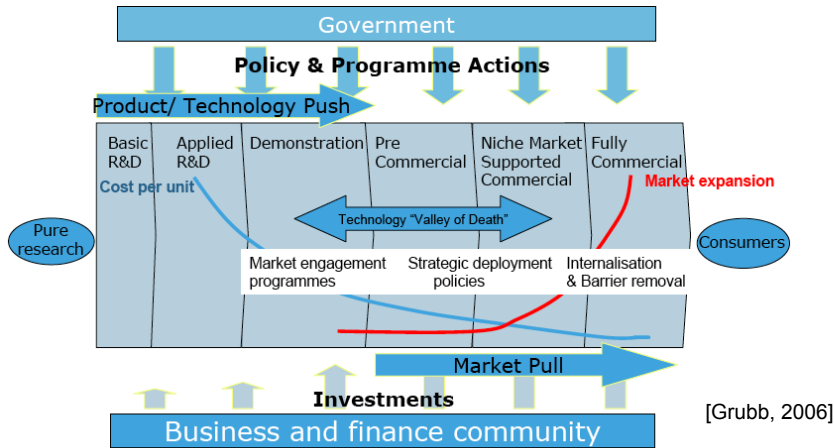
## **Presentation Outline**

- RE Technology acculturation challenges
- The KPDAC (Knowledge, Persuasion, Decision, Adoption, Confirmation) Continuum to explain RET acculturation process & requirements
- Off-grid PV and Hybrid case studies from Lampung, West Java & Nusa Tenggara Timur (NTT ) provinces and their KPDAC context
- Four quadrant RE market mapping to facilitate RET acculturation
- UNSW-ADRA EFCC011 research project activities in RE capacity building
- Conclusions & Recommendations

## RE Technology 'Valley of Death' & RET Acculturation Challenges

RE cost per unit still high; Market is nowhere near the commercial stage; Successful deployment requires both technology push & market pull [Grubb, 2006] and also smart deployment policy

**RE Cost (US\$ cent/kWh):** 1) Coal 6; 2) Micro Hydro 7-30; 3) Pico Hydro 20-40; 4) SHS 40-60 (Ind 70); 5) Small Wind:15-25 (Ind 50); 6) Village-scale mini grid 25-100 [REN21 2010, 2011, EBTKE 2010]



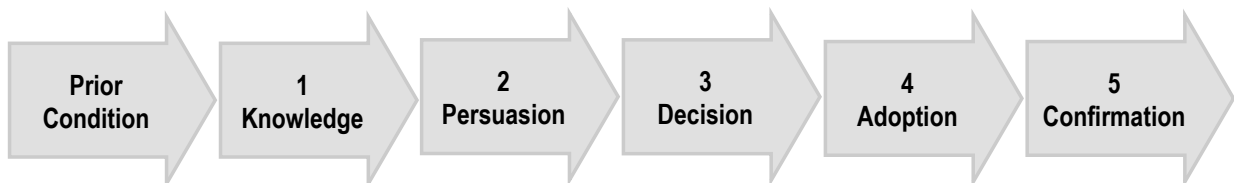
**What missing from the above is: the understanding of the critical importance of acculturation**

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## The KPDAC Continuum & Acculturation Process of RE Technology

**RET Acculturation:** The extent to which RET diffuses into and is assimilated by a community

*RET innovation-decision process:* Potential adopters progress from gaining *knowledge* of RET, to *forming an attitude* toward RET, to a *decision* to adopt or reject RET and, if to adopt, to confirm or repudiate the *adoption* decision (adapted from Rogers 2003)



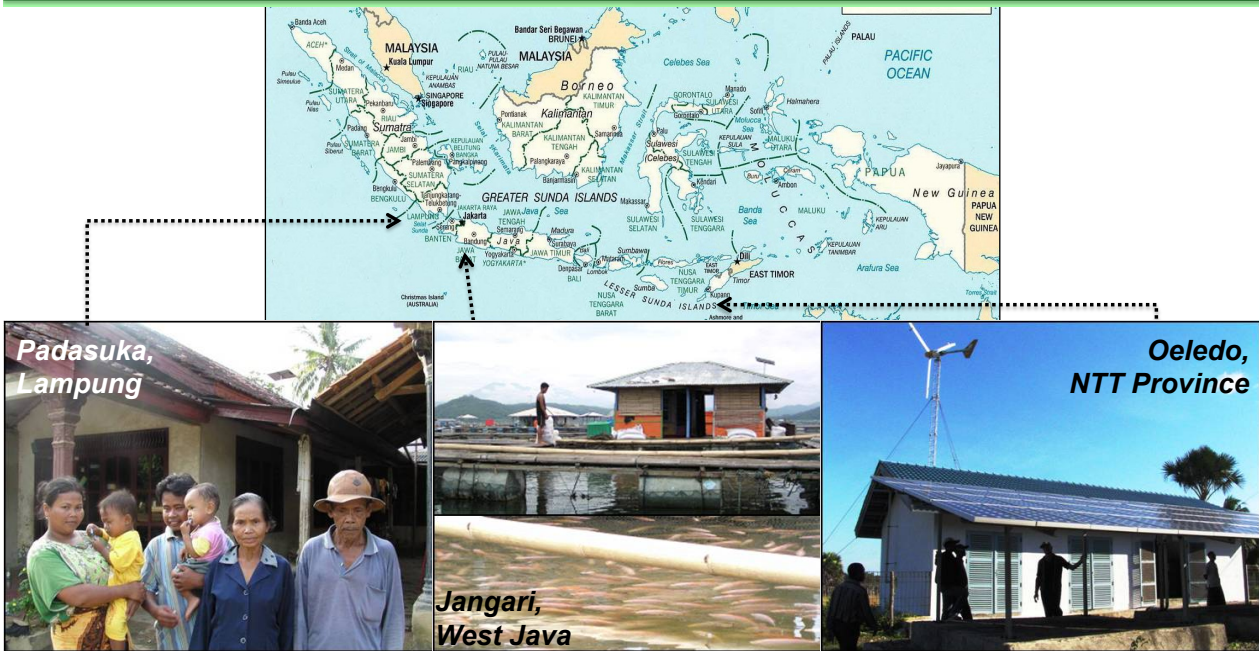
Unaware of RET existence	Aware of RET existence	Form un/favourable attitudes to RET	Decision to adopt or reject RET	Adopt RET; Re-invention may occur	Confirmation of RET adoption
<b>Q0.</b> Is the current practice the best option?	<b>Q1.</b> What is RET? How does it work? Why does it work?	<b>Q2.</b> What are the dis/advantages in my situation?	<b>Q3.</b> What are the consequences of my decision?	<b>Q4.</b> Where can I obtain RET? How can RET best fit my situation?	<b>Q5.</b> Dis/Continue RET adoption.
<b>Roles of Facilitators in each stage of the RET Acculturation process</b>					
Diagnose problems, shed light on alternative ways to address problems	Establish information-exchange relationship; Knowledge awareness; Promotion; Education: Provide sufficient and accessible information		Adoption, Implementation, Financial & Technical assistance, User education		Stabilize adoption, discourage discontinuation.

**RET Acculturation Process**

**RET is acculturated if Users can continue to confirm its benefits**

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## Locations of the Three PV Case Studies



- Padasuka village, Lampung: SHS organic market (emerged from a former formal SHS market) – Used & new modules
- Cirata Lake, Jangari village, West Java: 1997-2003 WB semi-com SHS project (provision of IBRD loan and 20% subsidy from GEF grant, certification of SHS testing facilities)
- Oeledo Village, Rote Island: E7 PV-Wind-Diesel Hybrid system (AIJ project between G8 and GOI, a CDM model)

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## KPDAC context of the Three PV Case Studies

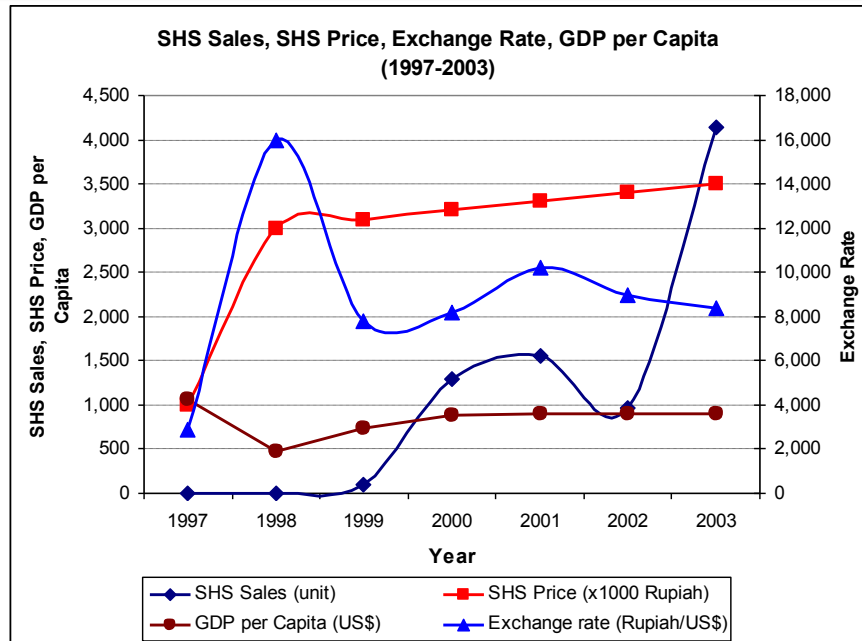


KPDAC Stage	Case 1 – Oeledo	Case 2 – Padasuka	Case 3 – Cirata Lake
Prior Condition	Stage 0 - Isolated community, skeptical of RET feasibility	Adoption Stage (4) – Users were already familiar with SHS use, maintenance & transaction; no longer questioning SHS function;	Wealthier community ranging from Stage 0 to 5
Knowledge	SHS demonstration, PLD formation, FO stayed for 2yrs to form PLD and cooperatives to enhance local economy	Confident buyers who could negotiate terms; maintained long battery life and reinvented SHS to save money and other uses (beyond lighting)	Promotion; Regular incomers more persuaded; 1997 fin crisis hampered SHS sales; Diesel fuel raised price helped sales
Persuasion			
Decision	127 out of 354 families subscribing, users paid DP and monthly fee		Wealthier villagers were main adopters; Reinvention occurred; Free SHS in conflict with project
Adoption			
Confirmation	PLD functioning, economy improved; further expansion hampered by high capital cost and repair cost for imported equipments; SHS was envisioned for future; PLD was viewed as a model	SHS was part of community life; SHS was seen as a commodity; further expansion hampered by lack of used modules & high cost of new modules; 50-60% of new module price was considered affordable	Mixed perception: Better lighting, increased security, practical, noise free VS lighting too bright; SHS attracted thieves, disappointment from overselling; 50-60% price desired; similar scheme wanted

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## Note on the Asian Financial Crisis and the context of case studies 2 & 3

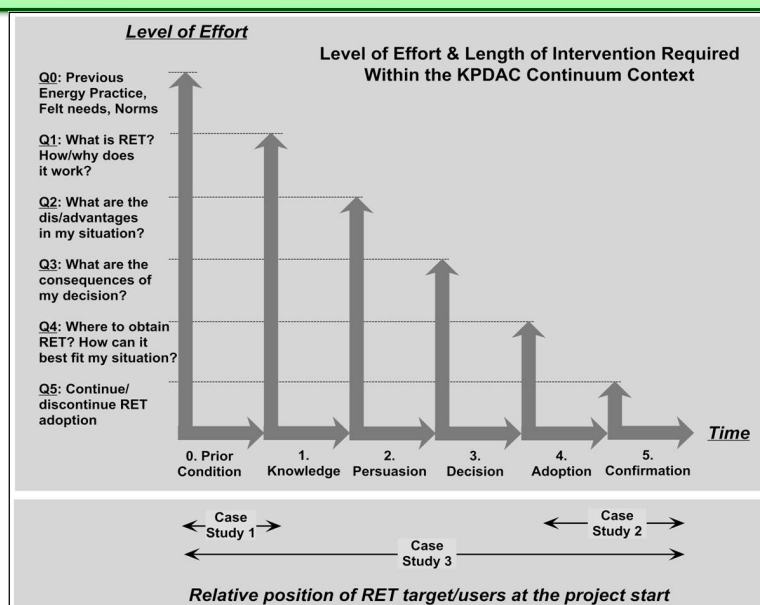
- 1997: Project start targeting 200,000 unit sales Financial crisis devalued rupiah, 50 Wp SHS price arose from US\$100 to US\$350-500
- 1999: Sales – 92 units
- 2000: Removal of fuel subsidy, kerosene up 140%, diesel 160%, electricity 30%, Sales – 1,299 units
- 2001: 1,552 units
- 2002: Minimum SHS capacity reduced to 10 Wp, Sales 972 units
- 2003: Further fuel subsidy reduction, kerosene up 360%, diesel 430%, Sales 4,139 units
- Total sales at project end 8,054
- (Source: PSG 2003)



In parallel, the financial crisis collapsed a formal SHS market in Lampung leaving thousands of SHS customers stranded without after sales service. The collapsed market evolved into an organic market with former sales representatives and technicians (local people) continuing the business, now buying both used and new modules while also providing after-sales service

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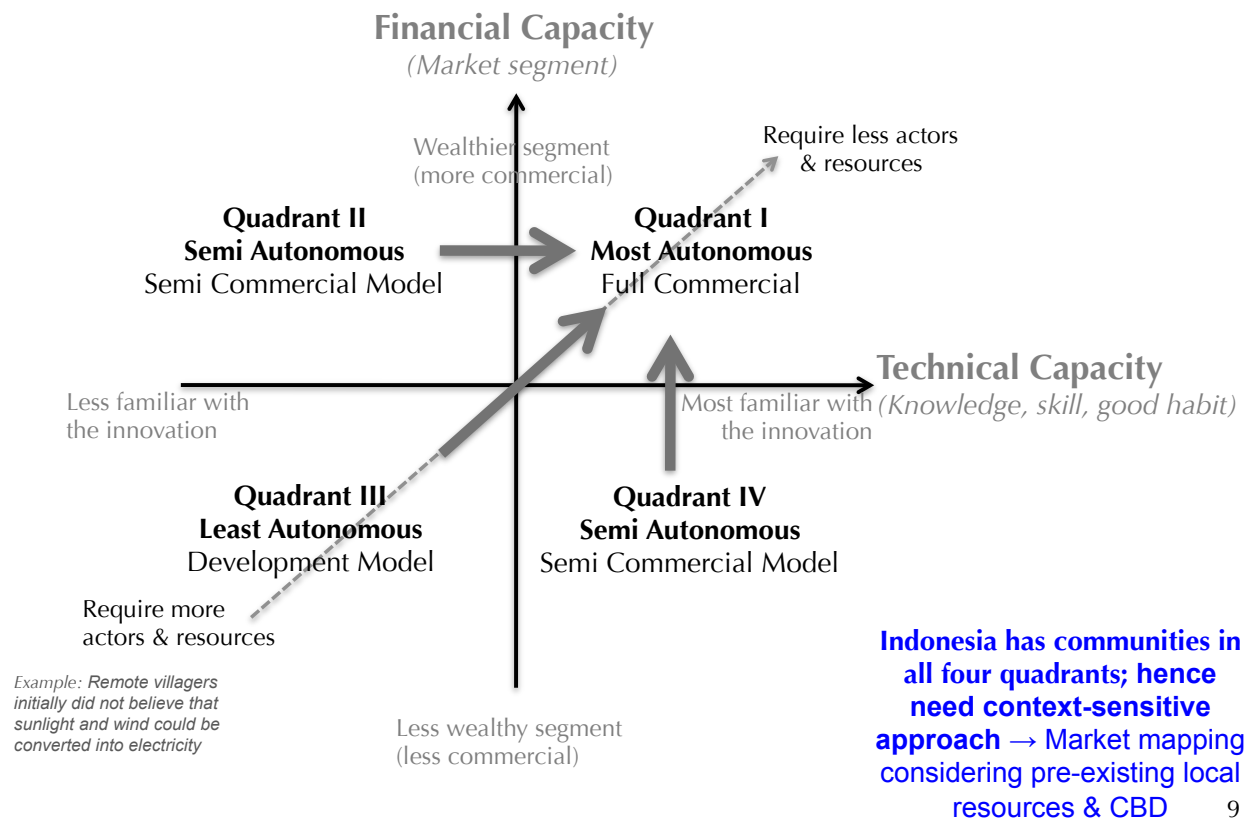
## The KPDAC Continuum & Users position at Project Start



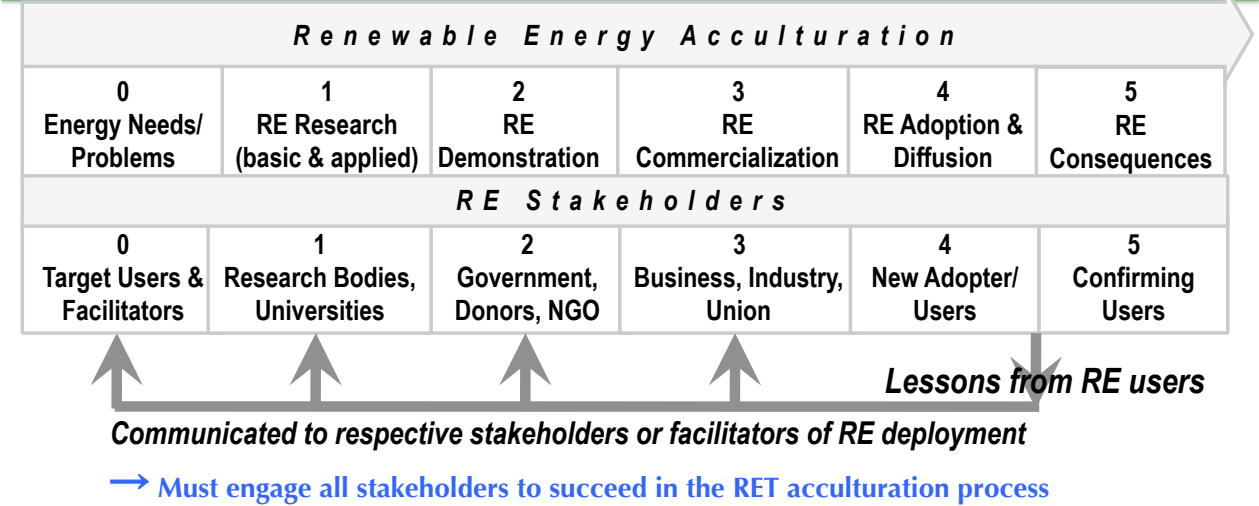
- Case study 1, Stage 0:** Require a complete traverse of KPDAC continuum (requires sufficient financial investment and highly capable agents)
- Case study 2, Stage 4-5:** Prior market (initial facilitator) created skilled local agent and critical mass, SHS acculturation was maintained through horizontal networks
- Case study 3, Stage 0-5:** Commercial approach worked for one segment (financially able & geographically accessible) but problematic for poorer & remote users

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# RE Market Mapping: Facilitating Financial & Technological Capacities



## UNSW-ADRA Research Project 2008-2011: Documenting & Sharing RE Lessons and RE Capacity Building through Education Institutions



## Conclusions & Recommendations

- **Acculturation of RET**
  - The KPDAC continuum is a qualitative tool to assess and design RET acculturation processes that complement quantitative approaches
- **Lessons from the three cases**
  - The earlier the starting position of target users in the KPDAC continuum, the greater the acculturation challenges and thus more resources required to facilitate the transition
- **Market mapping or clustering**
  - A tool to understand the starting position of target users in the KPDAC continuum, monitor their progression through it and support policy design
- **Education institutions**
  - Should educate policy professionals to design effective RET program and capable agents to facilitate RET deployment