



The I3A framework:
A diagnostic tool to assess energy service / arrangement sustainability and a design tool to design a sustainable energy service arrangement

For detailed discussion on conceptual background, see:
 Retnanestri, M., 2007, The I3A Framework – Enhancing the Sustainability of Off-grid Photovoltaic Energy Service Delivery in Indonesia, PhD Thesis, Submitted to UNSW,
http://primoa.library.unsw.edu.au/primo_library/libweb/tiles/rs/unsworks/datastream.jsp?pid=UNSWorks1598

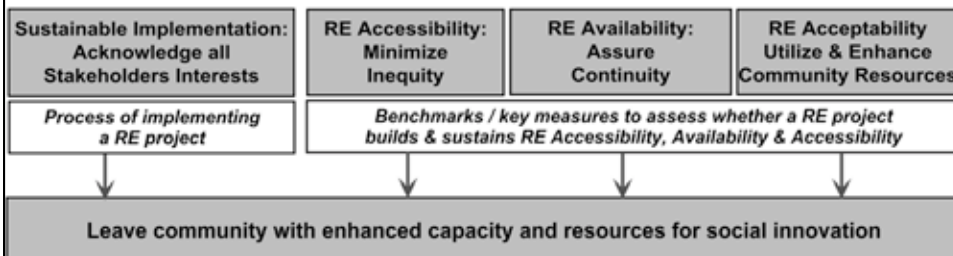
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 Guest Lecture, Sustainable Energy in Developing Countries,
 School of PV & Renewable Energy Engineering, UNSW Sydney 27 August 2012

What is I3A?

An **Implementation** that maintains RE service **Accessibility** (financing, skill, network, resources), **Availability** (reliability & security of supply) & **Acceptability** (social & ecological) considering the hardware, software & orgware aspects of RE service delivery during & beyond initial project life

A framework that is used as a **diagnostic tool** to assess energy service/arrangement sustainability or a **design tool** to design a sustainable energy service arrangement (scope: can be for country level or technology specific level)

What are the I3A objectives?



The 21 steps of the I3A model to assess energy arrangement sustainability

I3A Energy Sustainability

Implementation that maintains energy Accessibility, Availability & Acceptability in short & long runs

Implementation

Orgware & Enabling Factors

1. Orgware: Stakeholders, objectives, interrelationships
2. Enabling factors: Policy, strategy, administration, coordination, governance
3. External factors: Other programs, socioeconomic, political, global situations

Accessibility

Access to Financing & Resources

4. Affordability-Profitability (A-P) levels
5. Financial intervention to bridge the A-P gap
6. Access to energy financing, market, network
7. Access to energy education
8. Access to energy resources

Availability

Service Reliability & Resource Security

9. Primary resource availability
10. Technical quality: Standards, safety, warranty
11. Energy system integration
12. Domestic manufacturing
13. After-sales infrastructure
14. Local capable agent
15. User education

Acceptability

Social & Ecological Improvement

16. Utilization of local resources (institutions, economy, norms)
17. Attributes vs User needs
18. Socioeconomic outcomes
19. Suitability to environment
20. Energy waste handling
21. Contribution to climate change mitigation effort

→ I3A covers the Institutional, Financial, Technological, Social and Ecological aspects of RE service delivery



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Enhancing the sustainability of RE service delivery in 21 steps using I3A

Implementation *Orgware & Enabling Factors*

1. Orgware: RE stakeholders, objectives, roles, interrelationships
2. Enabling factors: Policy, regulations, administration, governance
3. External factors: Other programs, socio-economic/political situations

Accessibility *Access to Financing & Resources*

4. Affordability – Profitability (A-P) levels
5. Financial intervention to bridge the Affordability – Profitability gap
6. Access to RE financing, market, network
7. Access to RE education and training for non RE specialist
8. Access to RE resources

Availability *Service Reliability & Resource Security*

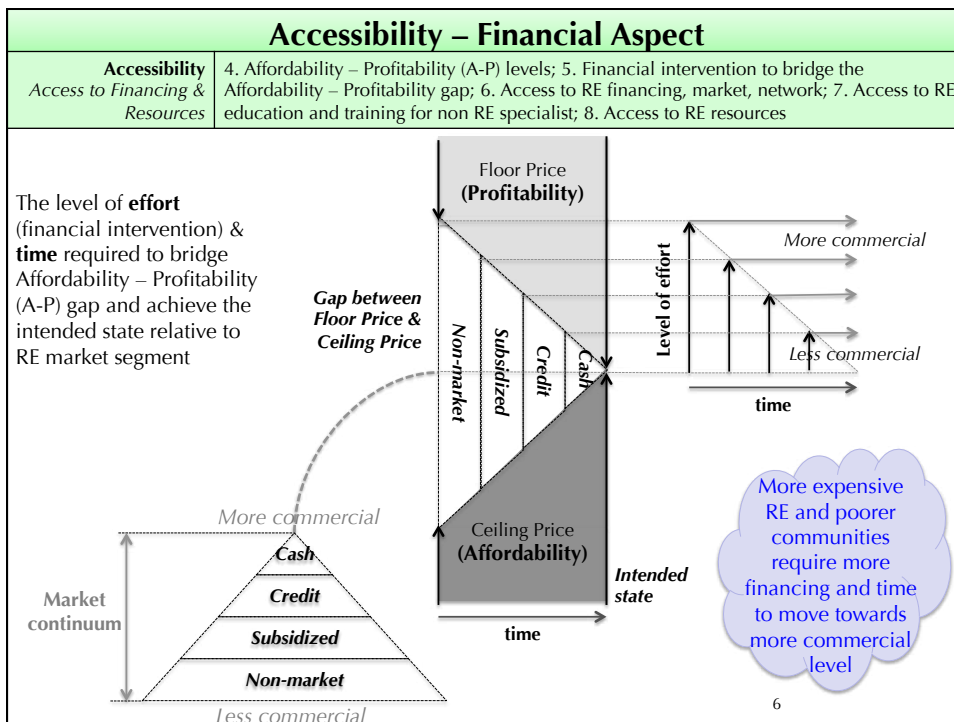
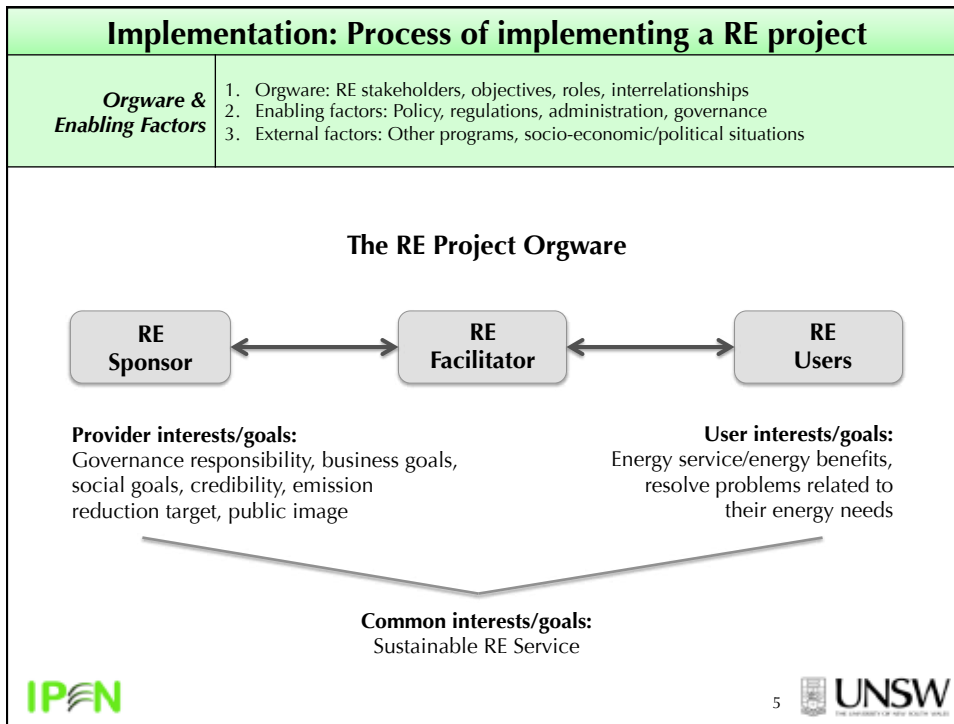
9. RE primary resources availability
10. RE technical quality: Standards, Safety & Warranties for components, system, installation, appliances
11. RE system integration
12. Domestic manufacturing
13. After-sales service infrastructure
14. Local capable agent
15. User education

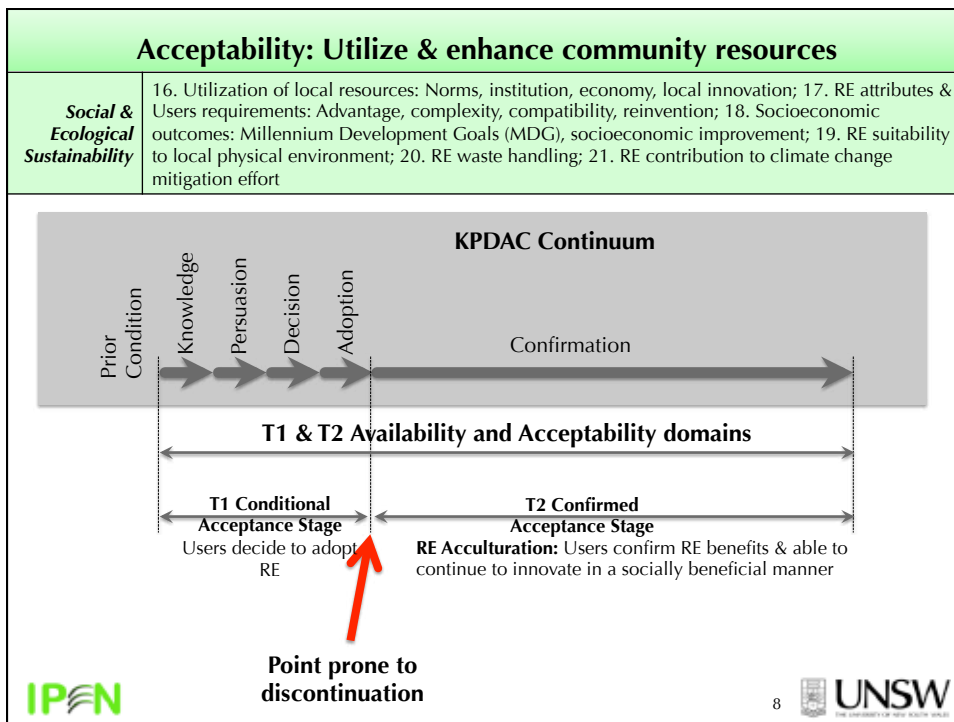
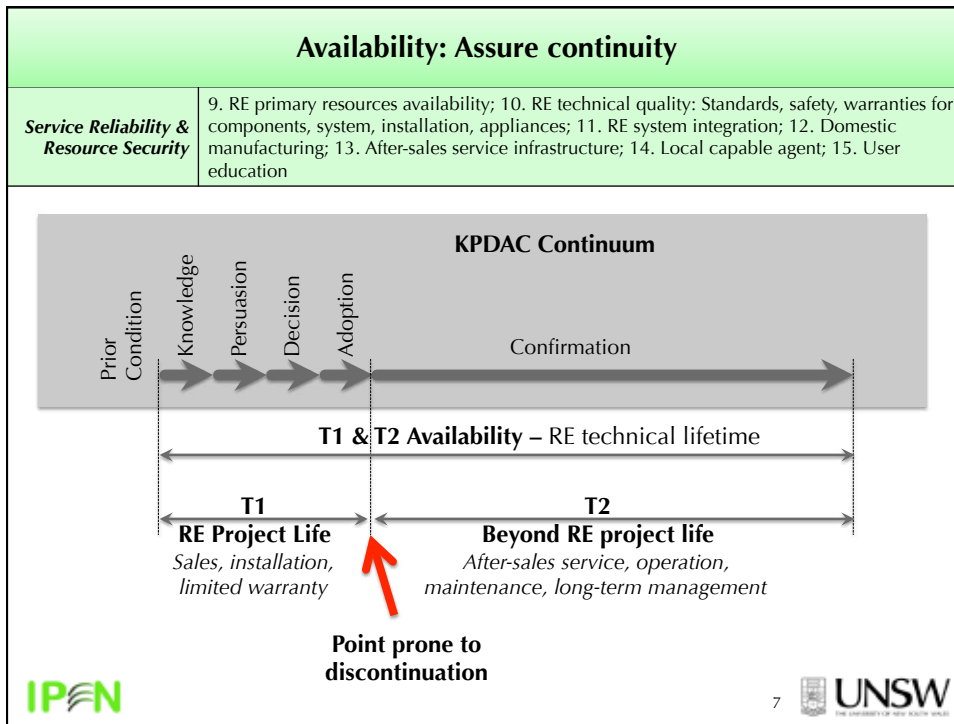
Acceptability *Social & Ecological Sustainability*

16. Utilization of local resources: Norms, institution, economy, local innovation
17. RE attributes & Users requirements: Advantage, complexity, compatibility, reinvention, etc
18. Socioeconomic outcomes: Millennium Development Goals (MDG), socioeconomic improvement
19. RE suitability to local physical environment
20. RE waste handling
21. RE contribution to climate change mitigation effort



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Example of the use of I3A:

The I3A workshop in Kupang, NTT Province, Eastern Indonesia, 8/6/2010

- Assessment of RE progress and challenges in NTT Province
- Group of mix of different stakeholders discuss, analyze & report the discussion outcomes
 - ABCG stakeholders: Academics, Business, Community and Government
- Demonstrated the use of I3A as a systematic diagnostic tool to identify RE potential and barriers
- Actively engaging diverse stakeholders, I3A can facilitate formation of consensus in identifying issues & formulating recommendations
 - I3A qualitative outcomes can be complemented with quantitative enquiries



Group discussion followed up with report of discussion outcomes

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Outcomes of the NTT's I3A Workshop – Brief Summary

Implementation: Orgware & enabling factors

1. RE stakeholders: Form **Forum Energi Daerah** & define roles, coordination & interrelationships among RE stakeholders (ABCG Academics, Business, Community and, Government in NTT)
2. Enabling factors: *Relevant policy & strategies for mainstreaming RE in NTT, accessible information for all*
3. External factors: Complimentary factors: *Existing programs and strong commitments from outside NTT to assist RE development in NTT*; Competing factors: *People in remote NTT are not open to external ideas for change*

Accessibility: Access to Financing & Resources

4. Affordability – Profitability level: *Poverty level in NTT is high (24% in 2010), the A-P gap is significantly high*
5. Financial intervention: *Financing from state or regional budget, community fund, incentives for RE developers*
6. Access to RE financing, market, network: *Collaborate with NGO, donor institutions*
7. Access to RE education: **Community training centre**, provision of RE training equipments, **field laboratory**, technology transfer
8. Access to energy resource: *Land dispute may impede RE development*

Availability: Service Reliability & Resource Security

9. Primary resource availability: *Solar resource available across NTT, wind and hydro in certain areas; resource mapping required*
10. RE Standards, Safety, Warranties: *Use of appliances complying to accepted standards; Training on Standardisation & Certification*
11. RE system integration: *Experts & training are needed*
12. Domestic manufacturing: *Maximize local content, transfer of manufacturing capacities to NTT, use of local wisdom/innovation*
13. After-sales service infrastructure: **Empower community & cooperatives** to sell spare parts & provide after sales service
14. Local capable agent: *Design curriculum for RE education from primary school to university level, workshop at kabupaten level*
15. User education: *Trained community group (through TOT) to train RE users; life skill training eg. RE for agriculture*

Acceptability: Social & Ecological Sustainability

16. Utilization of local resources: *Need understanding on the natural and institutional resources capacities for appropriate project design*
17. RE attributes & Users requirements: *RE equipments made more affordable, RE beyond lighting, more user friendly*
18. Socioeconomic outcomes: *RE to create jobs & welfare in NTT, RE for agricultural development important for NTT*
19. RE suitability to local physical environment: *Need understanding on the impacts of the environmental conditions to RE equipment*
20. RE waste handling: *Need understanding on the impacts of RE waste to the environment, AMDAL assessment needed*
21. RE & GHG mitigation effort: ()