Solar PV for electricity access in South Asia

Debajit Palit
Associate Director, TERI

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Off-grid Access System in South Asia

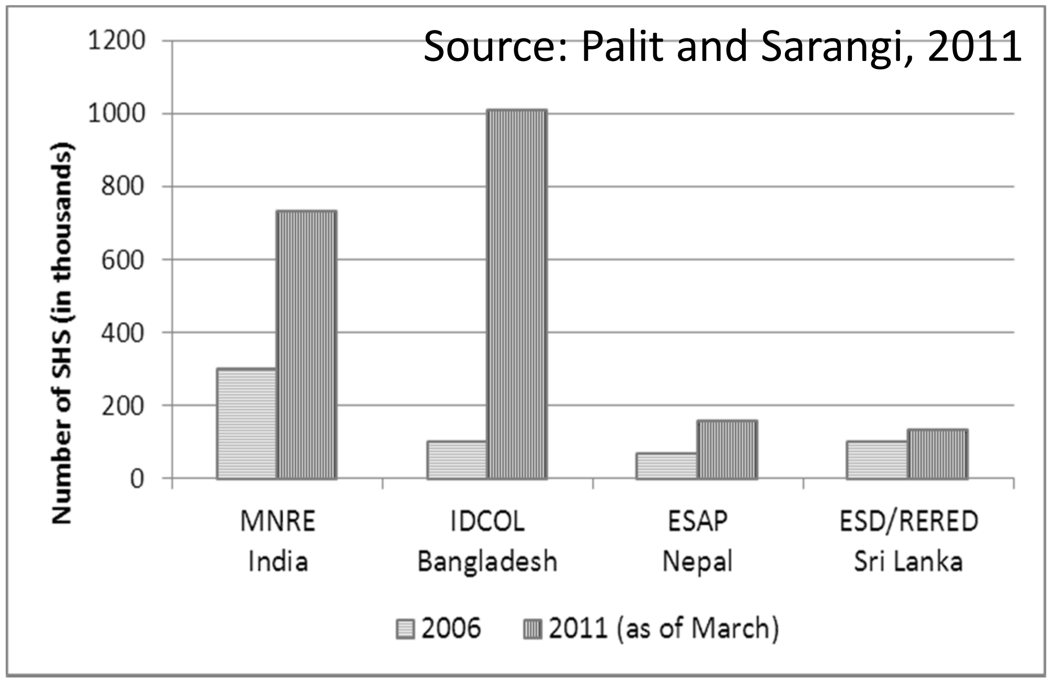
The OASYS Project Objectives:

- ✓ Are there cost-effective and reliable off-grid electricity supply solutions that can meet the present & future needs, are socially acceptable, institutionally viable and environmentally desirable?
- ✓ Do these local solutions have the scaling-up and replication potentials and can these solutions be brought to the mainstream for wider electricity access in the developing world?

www.oasyssouthasia.info

Solar PV in South Asia: Current Trend

- Mostly donor/subsidy supported projects, Also combination of free market and grant based models
- Decentralized solutions
  - Solar Home Systems (SHS) & Solar Lanterns (SL)
- Centralized solutions
  - AC mini grids
  - DC micro grids
  - Solar Charging Station



Solar PV found to be the preferred option for rural electrification after grid extension

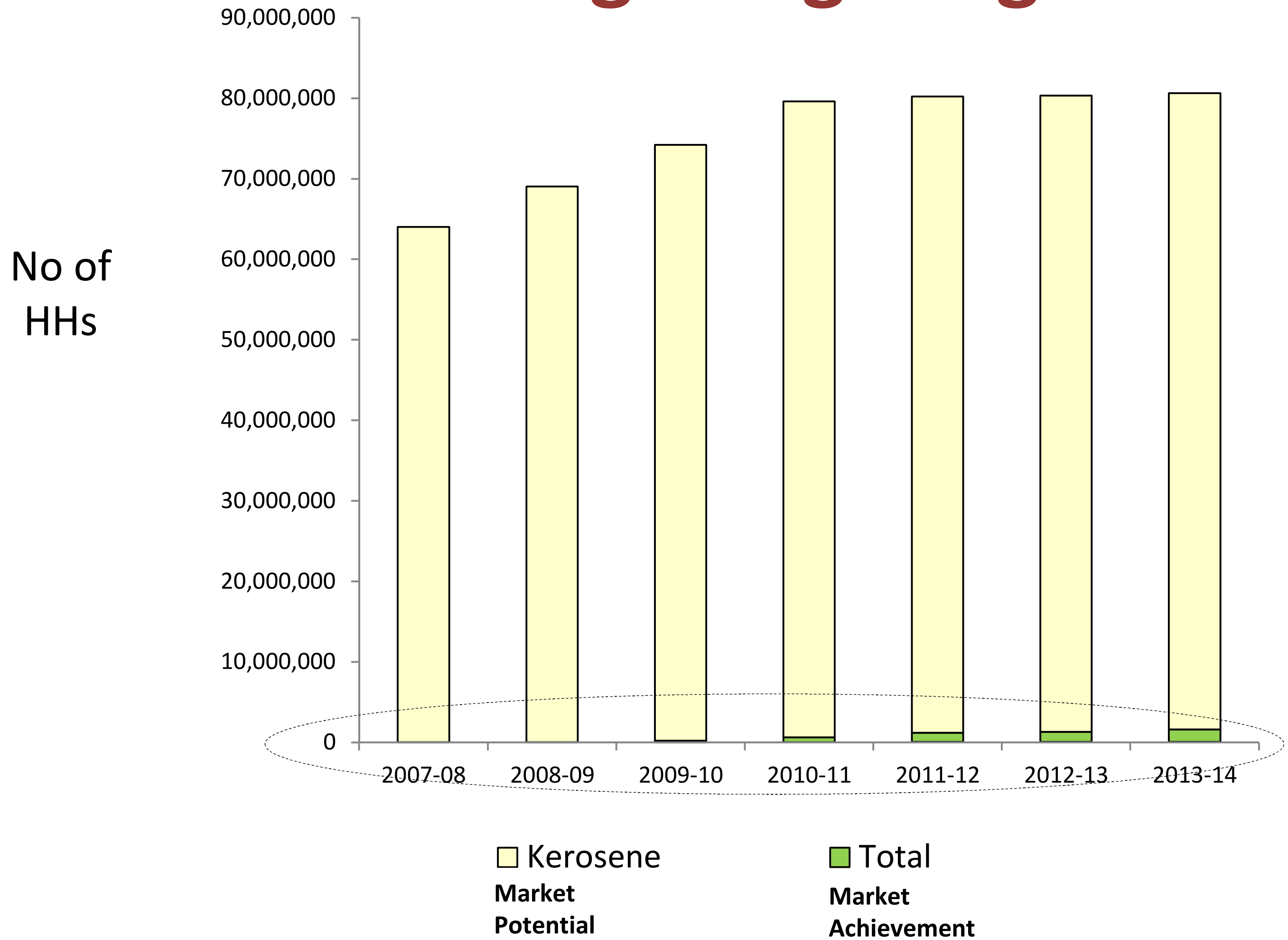
South Asia: Technologies & Business Models

Country	Technologies implemented	Business models	SHS pricing $/Wp
India	SHS, SMG, SL	Product Subsidy, Leasing Consumer financing, Village Energy Committee	7.5
Bangladesh	SHS	Credit Sales	6.5
Nepal	SHS, SSHS	Product Subsidy, Credit Sales	11.6
Sri Lanka	SHS	Consumer financing	9.6

Source: Palit and Sarangi, 2011

- Lower system cost in Bangladesh & India due to local assembly & manufacturing

Potential vis-à-vis Achievement in India Off-grid lighting



Source: TERI analysis, 2012

Case Examples

Solar Mini Grids in Chhattisgarh

- Providing access to population earning less than 1$/day
- Remote, tribal communities w/o cash disposable income
- Subsidy vs. financing – affordability ?
- Subsidy for capital infrastructure ?
  - ensuing operational sustainability ⟹ improved quality of life

CREDA has reportedly electrified around 35,000 households through solar PV based mini-grids

Financing of Solar Minigrids

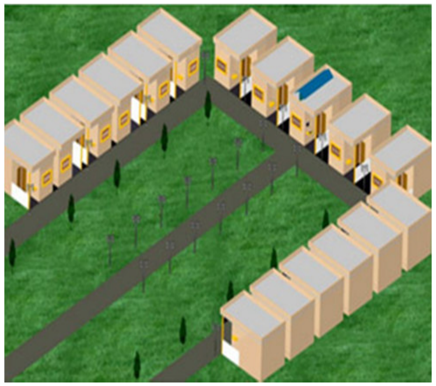
- Capital cost ~ 25000 INR (500$) per household
- Capital subsidy
  - 18,400 INR (368$) per HH – by MNRE under RVE program
  - Balance by state government
- Tariff per connection = 30 INR/0.6$ (2x11 W CFL)
- Tariff subsidy (by Chhattisgarh government)
  - 25 INR (0.5 $) per HH connection

Source: CREDA and TERI

- In Sunderban region, tariff for mini-grids ranges between 2-3$ depending on light points (3-5) for 4-5 hours supply

Source: CREDA and WBREDA, 2012

Solar DC micro grid – New Development



Solar Power : 50 households connected from ~ 400 Wp of solar panels.

Battery Bank: 24 V 100 Ah of storage capacity. Batteries are stored in a cabinet inside the same house or distributed battery storage at HHs

Power Distribution: DC distribution lines run along the rooftops from the battery bank to households over a short distance. Power is distributed for 5-6 hours at 24 V

LED: Each household having 2 LED lamps (total 2-3 W)

Installation Cost: Rs 3200 – 3800 per household

Tariff: Rs 120 – 150 per month, charged by the operators

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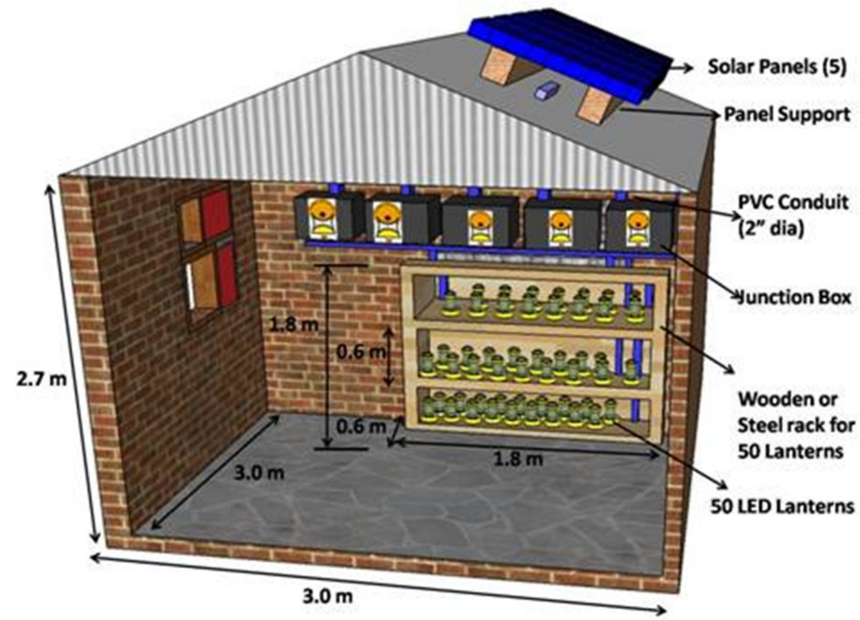
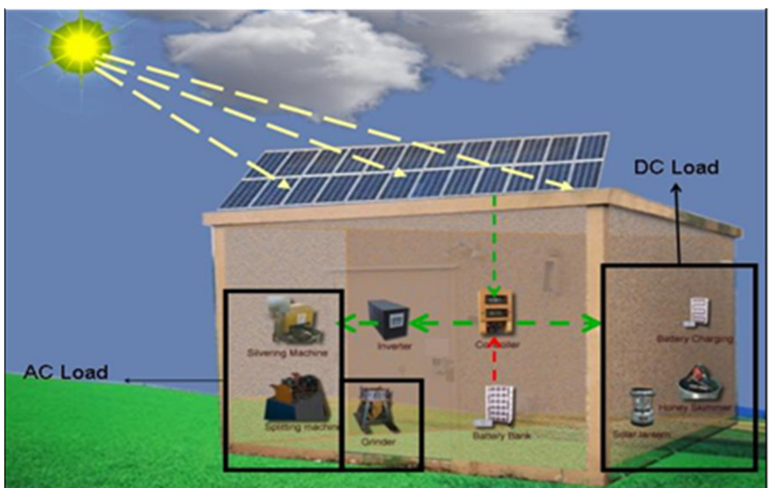
Solar Charging Stations – Fee for Service

Charging stations are expandable to solar energy hubs providing :

- Battery charging
- Mobile charging
- Lantern charging
- Water purification





- **Cost** : Rs 0.9 – 1.1 lakh per SCS/50 lanterns
- **Tariff**: Rs 2-5 per night per lantern

Source: TERI, 2012

Off grid…..

- Recognition (UN and National Agenda) – SE4ALL
- Formulation of policies/programs (JNNSM, Planning Commission –LWE scheme, LaBL, Lighting India etc.)
- New technologies – long life batteries, high efficient LEDs
- Investments by private sector
- Reduction in costs in recent years, making projects viable
- Wider menu of products (portable, fixed lights etc).

Challenges remain….

- Stakeholder networking
- Absence of value chain for Solar PV/allied products
  - Feedback - customization loop
  - Reluctance to set up retail sales and service network
- Technology
  - Untested products/Absence of performance benchmarking/ standards
  - Limited local technical capacity
- Wherever responsibility outsourced to equipment suppliers dissatisfaction with timeliness of maintenance
  - Single Window model vis-à-vis Two Window model (IDCOL, SELCO)
  - Loan repayment directly impacted by improper service

Challenges ….

Policy

- No long-term policy instruments for solar PV
- Dissemination suffers from uncertainty in political framework conditions
- Cross- subsidy in grid electrified villages – a deterrent for solar PV
- No clarity on LT grid connection, rules out grid as an anchor load

Financing

- Credit is independent of income level
  - Financial mechanisms are not in line with income level of poor HHs (the section w/o electricity access)
  - Sometimes lengthy process & rigid loan payment terms
- Absence of finances all along the supply chain (e.g. service network)
- Debt financing from banks difficult
  - Higher perceived financial and technology risks in rural setup
  - Rural entrepreneurs lack history of profit making

Some Lessons from Solar Mini grids

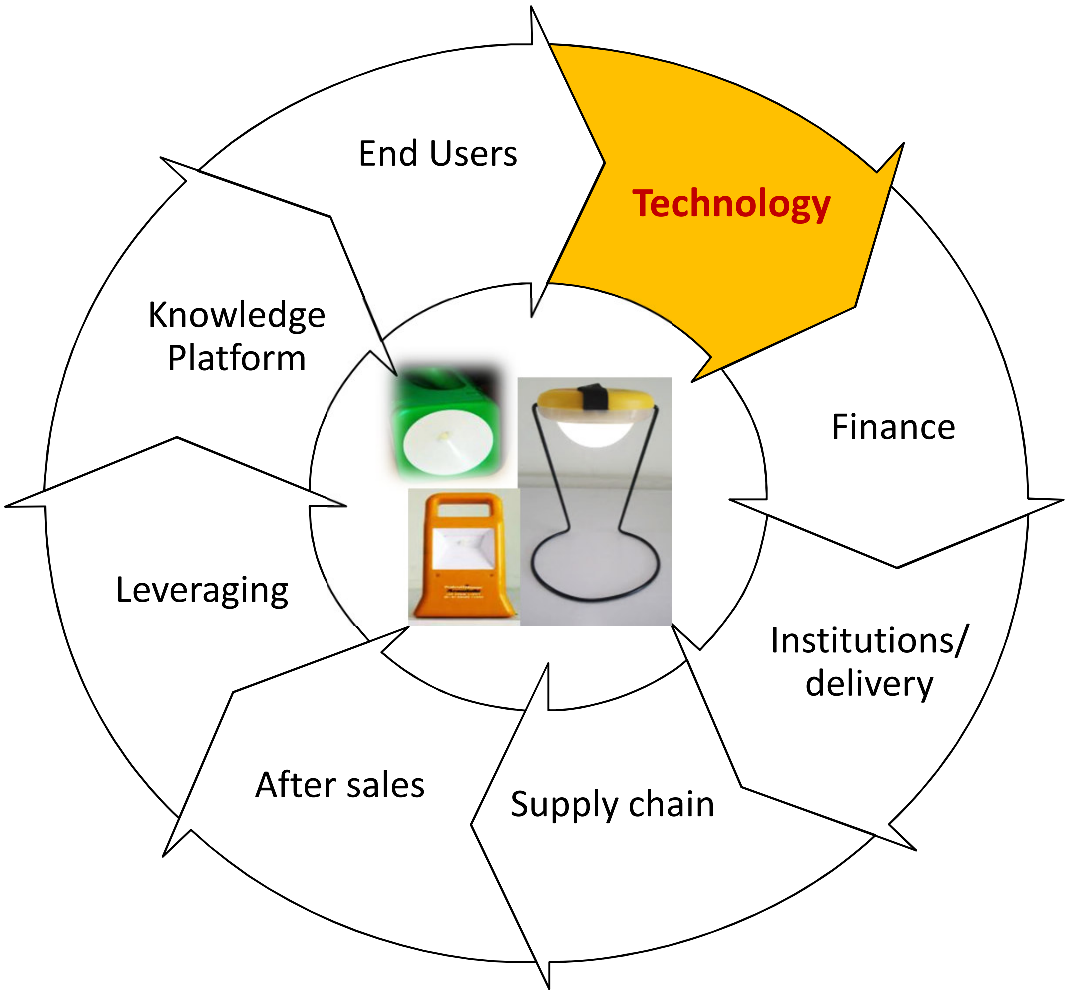
- Decentralized, usually low capacity, covering remote areas
- Usually domestic loads served
- Limited by capacity and duration of supply
- Community as stakeholder
- **Tariff based on flat rate**, locally decided, depending on O&M cost and WTP
- Non commercial in nature
- Clustering of projects more successful

- Inability to meet increased demand
- Single energy resource catering to fixed load for fixed time
- Battery – vulnerable, overdrawl by most consumers
- Generation not as per design – quality issues of solar panel
- Difficulty in O&M because of remoteness
- Not linked to any productive enterprise/ irrigation pumpsets – viability ??

- Technology development – Smartness of mini-grid addressing some of the above challenges
- Hybrid systems – addressing single resource and load issues

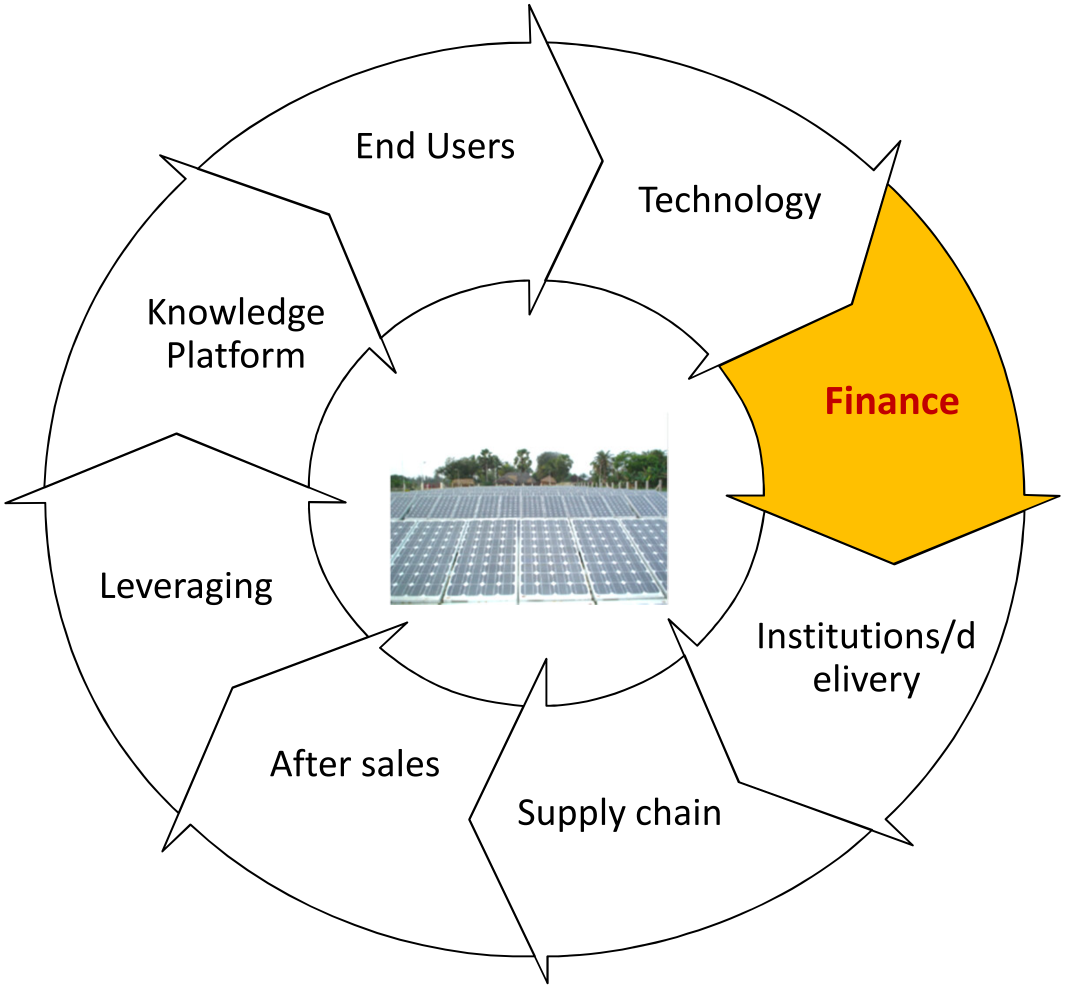
Overcoming challenges ……

Technology ……



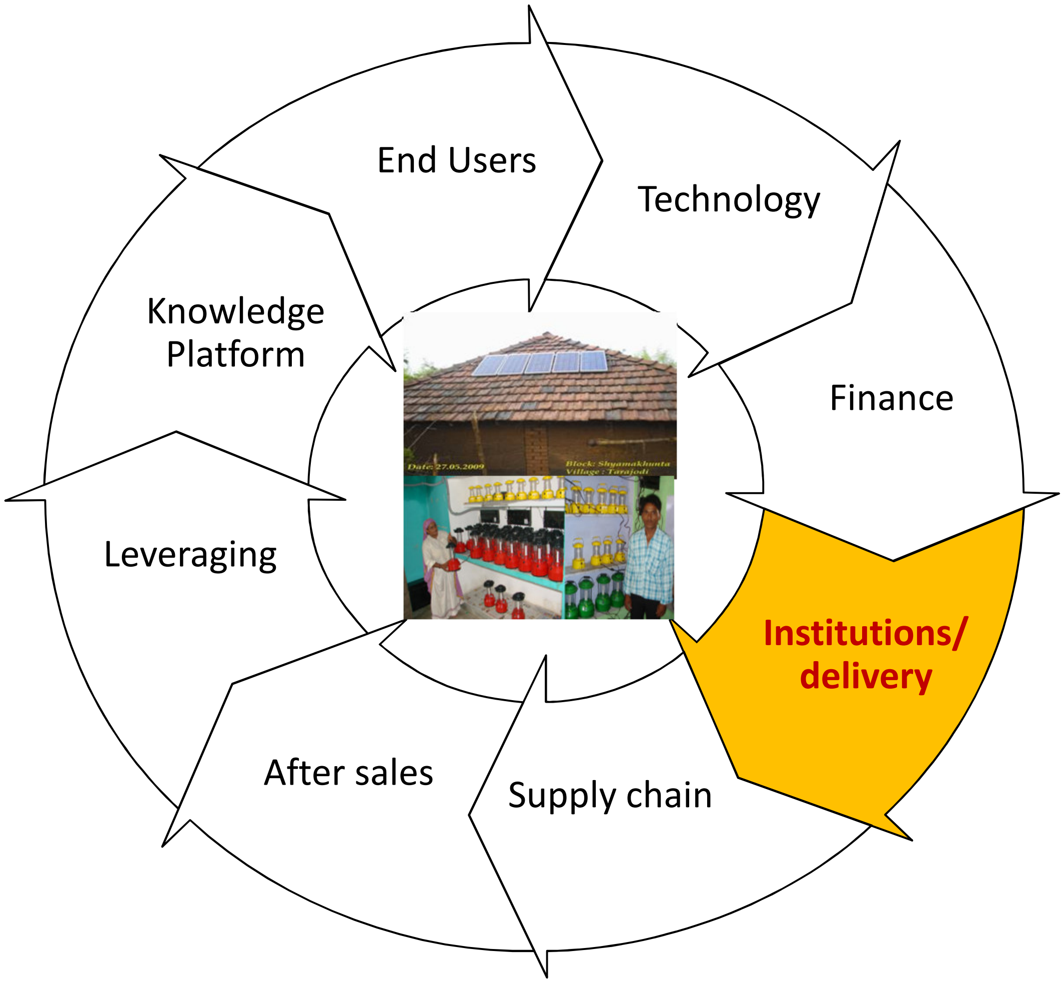
- (Customized) products best suited for rural areas
- Suite of technology designs/ models; E.g. hybrid models
- Decision on technology should be based on availability of skill-sets of local people
- Cost reduction through innovation and new configuration designs

Finance ……



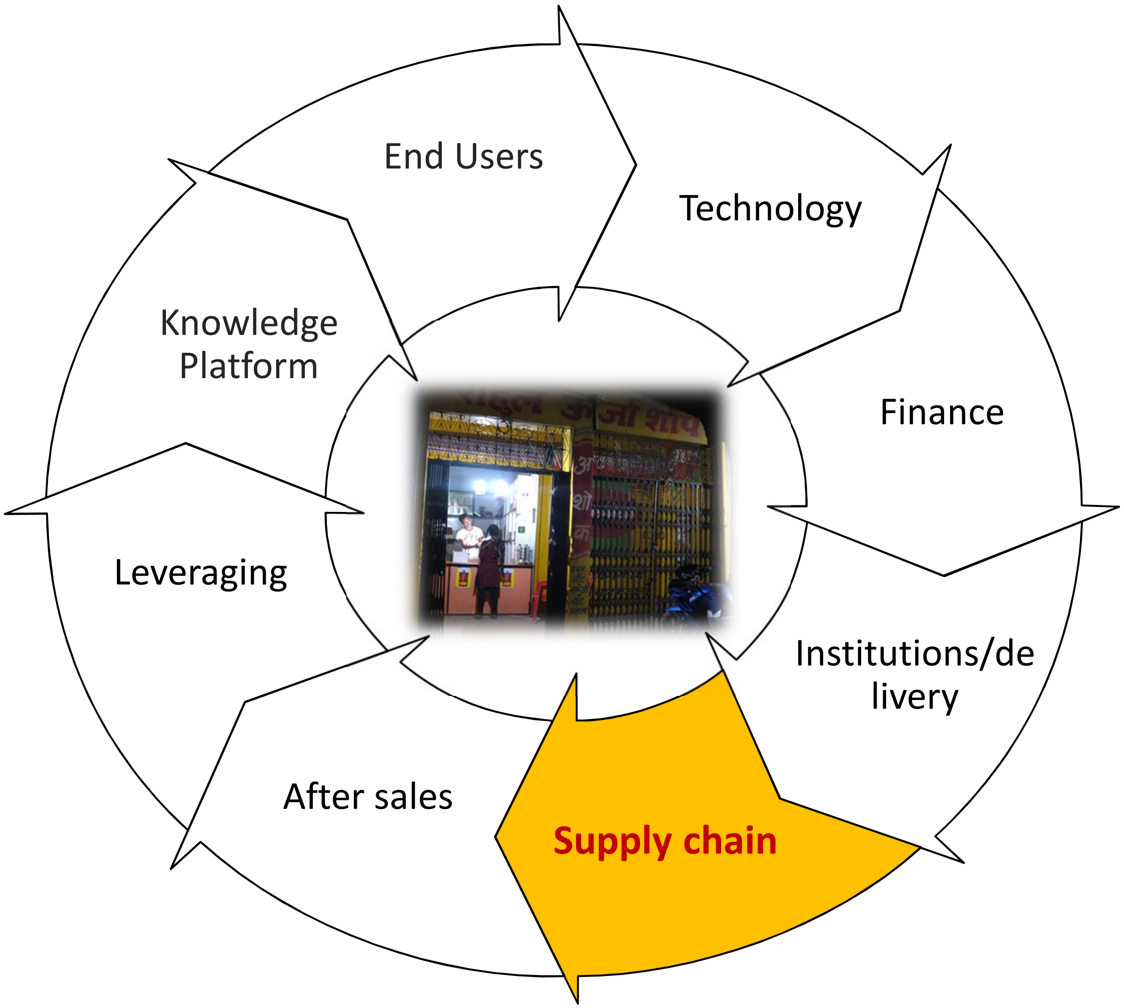
- Improved & affordable access to capital with flexibility along value chain/ Priority sector lending
- Bankable projects to prove the viability of solar technology
- Extension of viability gap funding to off-grid solar/ Risk guarantee fund /
- Mix of Grant: Debt: Equity

Institutions/delivery ……



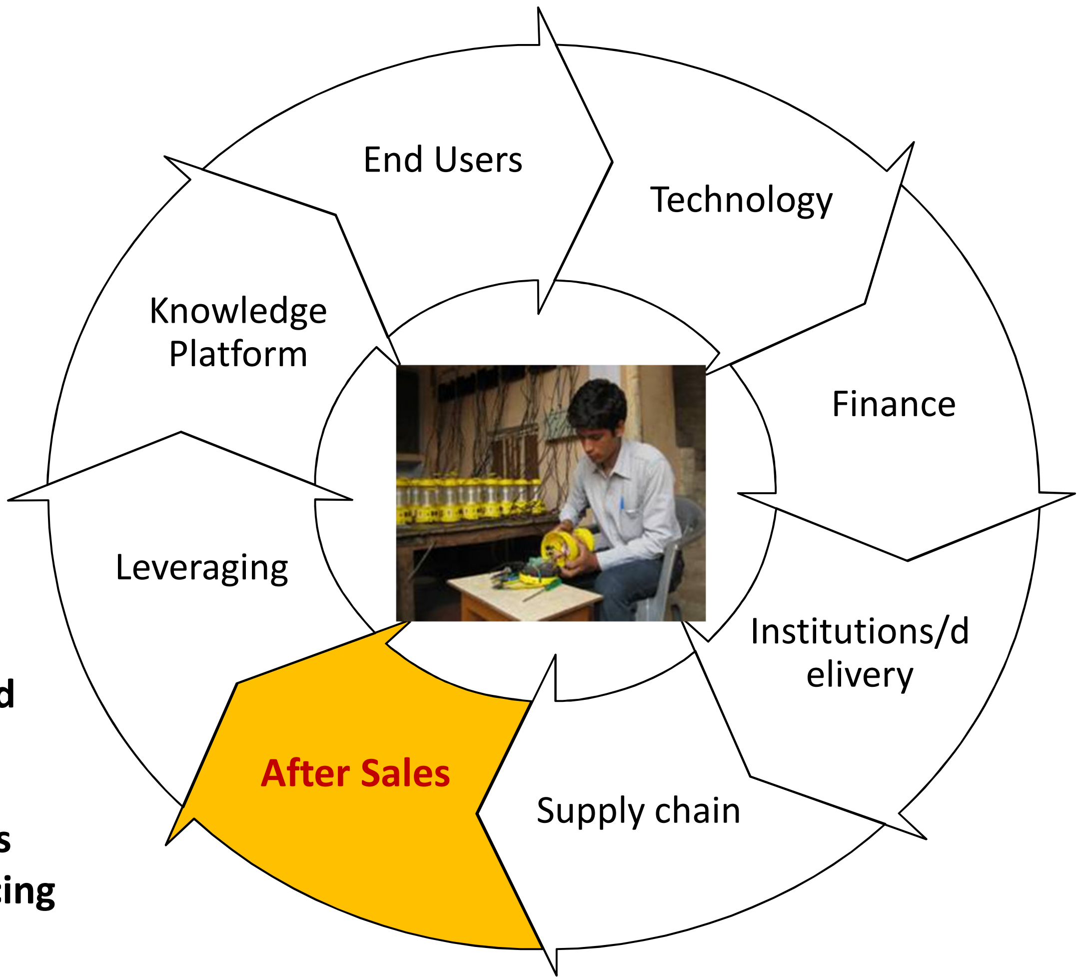
- Organised delivery model (e.g. involving DISCOMS)
- Reducing costs…New operating models (BOOM, BOM etc.)
- Adopting standard process and metrics for scaling up
- Build scale/bundling to cut costs & ensure bankability
- Creating an eco-system for solar electrification

Supply chain ……



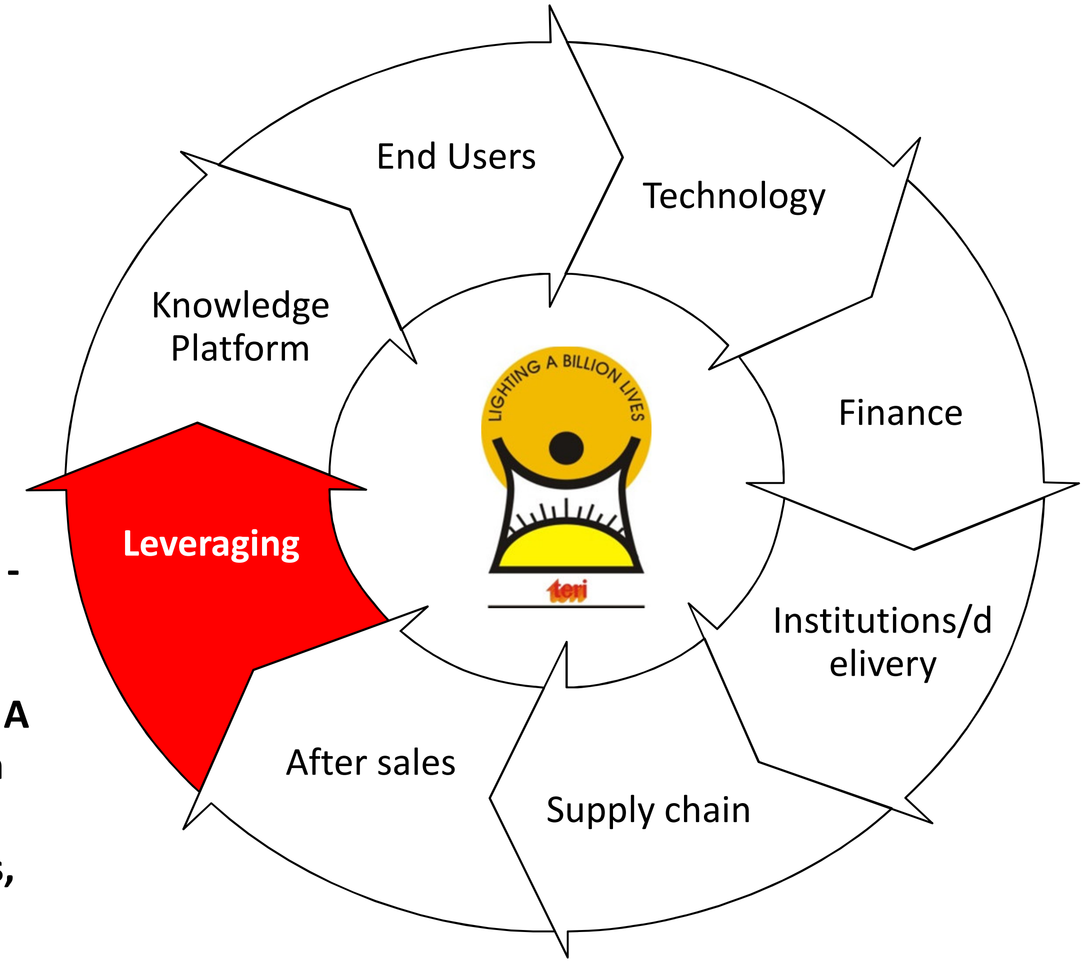
- **Feedback for appropriate technology development and customization**
- **(Strict) adherence to QAQC - Making Quality the key vehicle**
- **Last mile access for products and (spares) – missing link**

After sales ……



- **Ensuring smoother after-sales and maintenance**
- **Creation of local level enterprises that act as hub for sale and servicing of clean energy products**

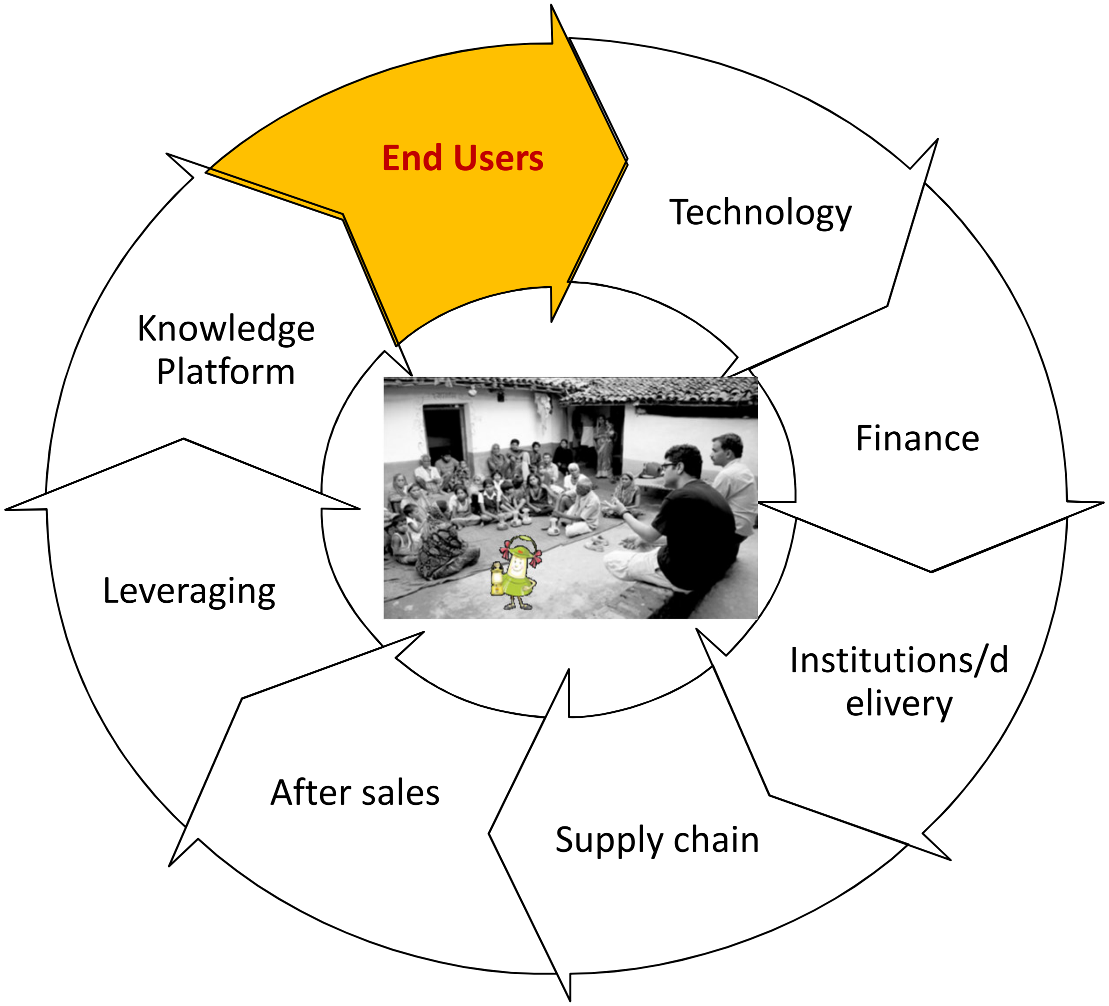
Leveraging ......



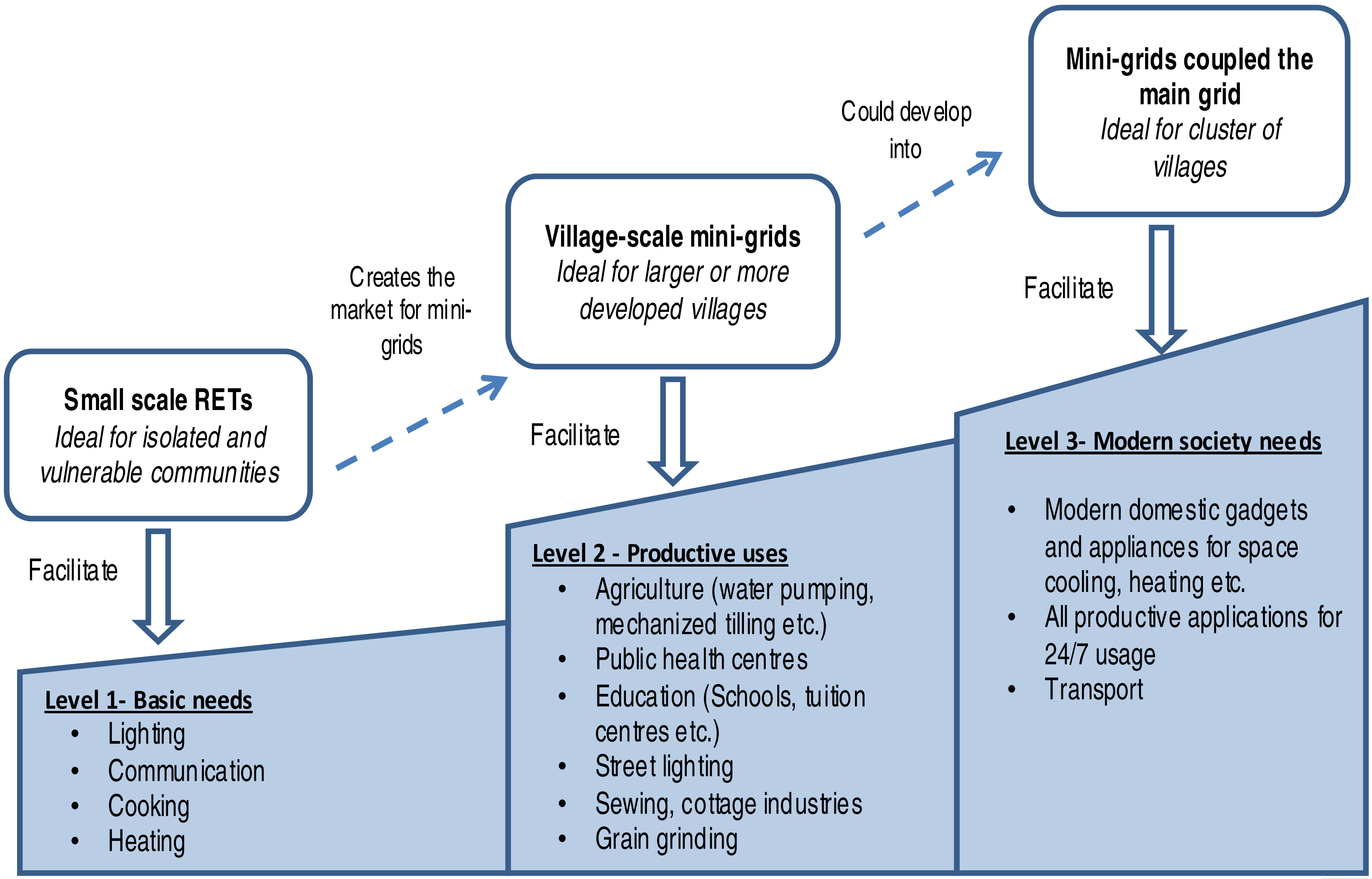
- **Strategic alliances to mainstream energy access within development framework (e.g. NRLM)**
- **Mobilizing resources through CSR - Viability gap**
- **Lighting a Billion Lives program – A unique example of extending clean lighting through leveraging – Govt, PSU, Industry, Banks, Media, NGOs, Youths**

End Users ……

- **Regular stakeholder engagement**
- **Intensive sensitization**
  Small is tender



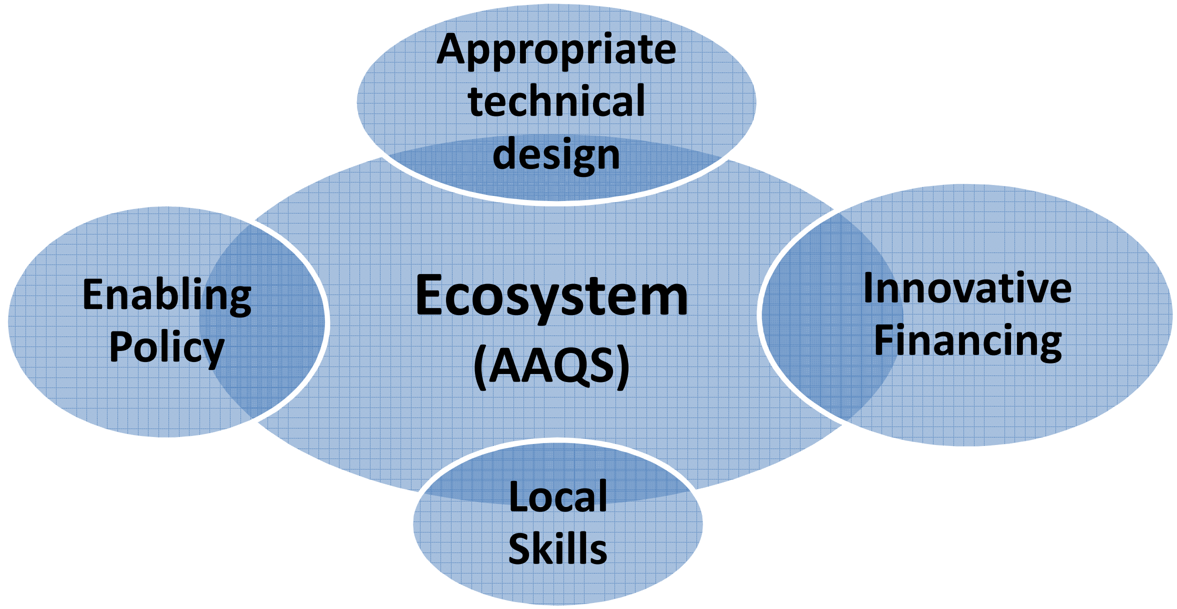
Framework for Scale up



Source: TERI, 2012

In conclusion

Sustainability condition



Thank You

debajitp@teri.res.in

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