

Energy innovations: a focus on clean technologies for livelihood generation in India

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*Asia LEADS Forum 2014: Development through
LEADS and Green Growth*

Yogyakarta, Indonesia
November 11-13, 2014,

Rural Energy Poverty in Asia

- Since 2000, around 2/3rd of the people gaining access to electricity have been in urban areas and the population without electricity access has become more concentrated in rural areas.
- More than 8 out of 10 people without modern energy access live in rural areas
- India has < 1/5th of world's population but has ~ 40% of world's population without access to electricity

Electricity access in Asia in 2011

Region	Population without electricity millions	Electrification rate %	Urban electrification rate %	Rural electrification rate %
China	3	99.8	100.0	99.6
India	306	75.3	93.9	66.9
Southeast Asia	134	77.6	90.5	67.2
<i>Brunei Darussalam</i>	0	100	100	99
<i>Cambodia</i>	9	34	97	18
<i>Indonesia</i>	66	73	85	60
<i>Laos</i>	1	78	93	70
<i>Malaysia</i>	0	100	100	99
<i>Myanmar</i>	25	49	89	29
<i>Philippines</i>	28	70	89	52
<i>Singapore</i>	0	100	100	100
<i>Thailand</i>	1	99	100	99
<i>Vietnam</i>	4	96	100	94
Rest of developing Asia	172	61.4	81.9	51.7
<i>Bangladesh</i>	61	60	90	48
<i>DPR Korea</i>	18	26	36	11
<i>Mongolia</i>	0	88	98	67
<i>Nepal</i>	7	76	97	72
<i>Pakistan</i>	56	69	88	57
<i>Sri Lanka</i>	3	85	96	84
<i>Other Asia</i>	27	32	59	22
Asia	615	83.1	95.0	74.9

Green growth and inclusive development in rural areas (1/2)



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- Decentralized solutions and clean energy technologies have the potential to reduce energy imports, improve the stability of electricity supply, save costs, save climate (Martinot et al. 2002, Chaure et al. 2004, Verma & Cisse 2004, ESCAP 2005).
- Few studies have empirically established the potential of clean energy as a driver of poverty alleviation in developing countries (Meadows et al. 2003, Toman and Jemelkova 2003, Martinot et al. 2002, Cabraal et al. 2005).
- Clean energy based *technological applications* and *innovations* can play an enabling role in livelihood enhancement in non-electrified rural areas.

Green growth and inclusive development in rural areas (2/2)



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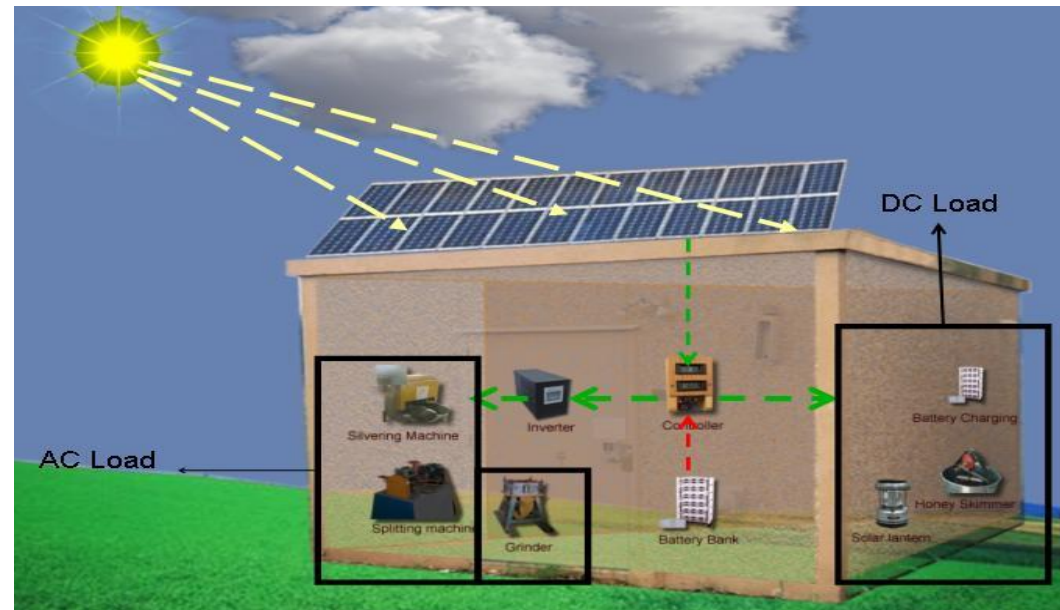
- Key challenges for dissemination of appropriate RE system:
 - **Effectiveness (viability, reliability, applicability) of offered technology**
 - **Emphasis on technology demonstration or target oriented programmes like Remote Village Electrification**
 - **Programmes implemented on the basis of broad administrative criteria, such as providing access to electricity to rural people, rather than focusing on more specific outcomes, such as increasing user's capacities to generate income or other benefits**
- Limited efforts on customising a set of new and existing technologies (a combination of solar/ wind/ biomass/ battery storage/ power interface etc.) specifically for livelihood activities for improving reliability and hence uptake of electricity services as well as enhance their cost-effectiveness.
- One of the international studies has shared this perspective in the context of limited success of renewable energy programmes (Urmee & Harries 2009).

Clean energy innovation for livelihood generation in India - Solar Multi-Utility (SMU) Platform (1/2)



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- A multi-utility platform that utilizes the locally available solar energy resources to generate electricity.
- The generated electricity would then be used for variety of applications such as charging lanterns, powering other appliances such as computer, mobile phones, water purifier etc.
- SMU is located near the energy utilization points in a village to provide electricity services as per the need of the community.



Clean energy innovation for livelihood generation in India - Solar Multi-Utility (SMU) Platform (2/2)



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- Using a multidisciplinary and participative perspective the research investigates the opportunities and challenges for social as well as technological innovations in the development and deployment of clean energy based technological applications in rural India, and how can such innovations contribute to the achievement of important social goals for the population.

Contextualizing innovation

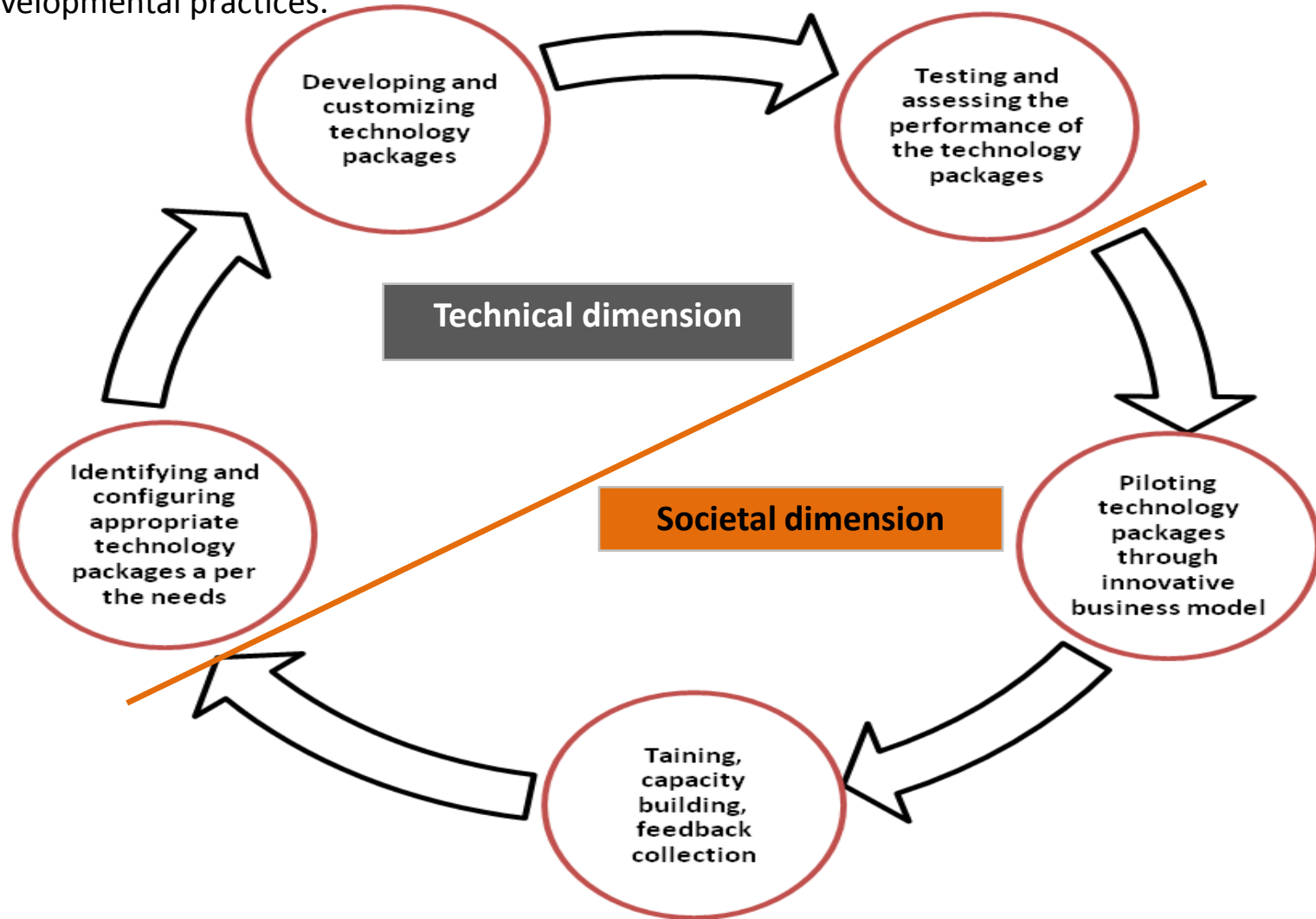


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- Innovation understood as the process of improving or developing clean energy technologies, technological systems and their impact on specific livelihood related end-uses
- Innovation in the entire value chain of generation, implementation and utilization of renewable /clean technologies
- Technology not only designed and integrated adequately but also delivered through an effective service delivery model with an active community involvement

Dimensions of innovation:

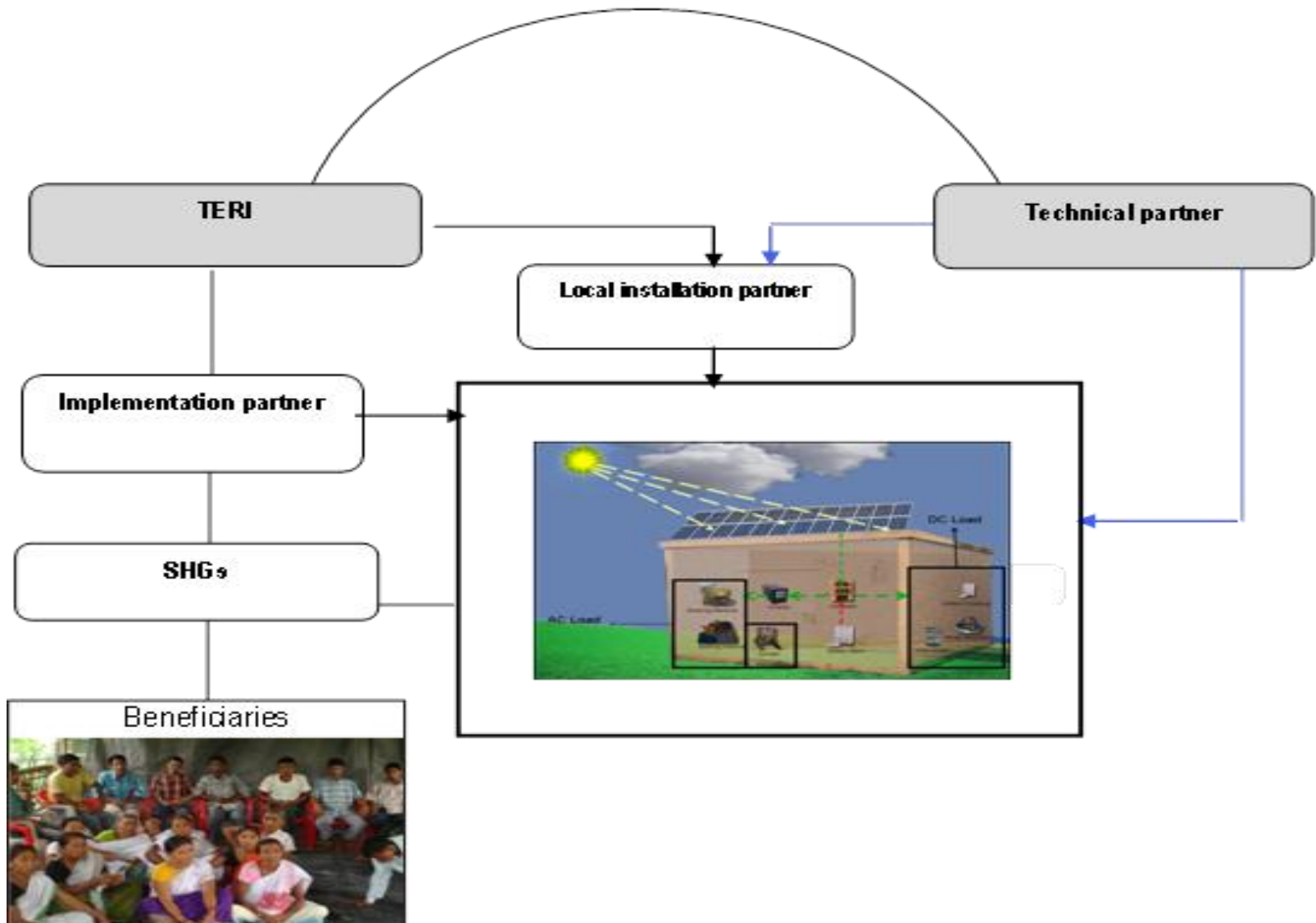
- Use of latest technological and scientific know-how in designing, developing, customising and testing technologies to meet specific end-use applications of rural communities in reliable and cost-effective manner
- How communities associate themselves with the newly introduced technologies and accept/enhance the uptake of the energy services for their socio-economic benefits and transition to sustainable developmental practices.



Institutional framework



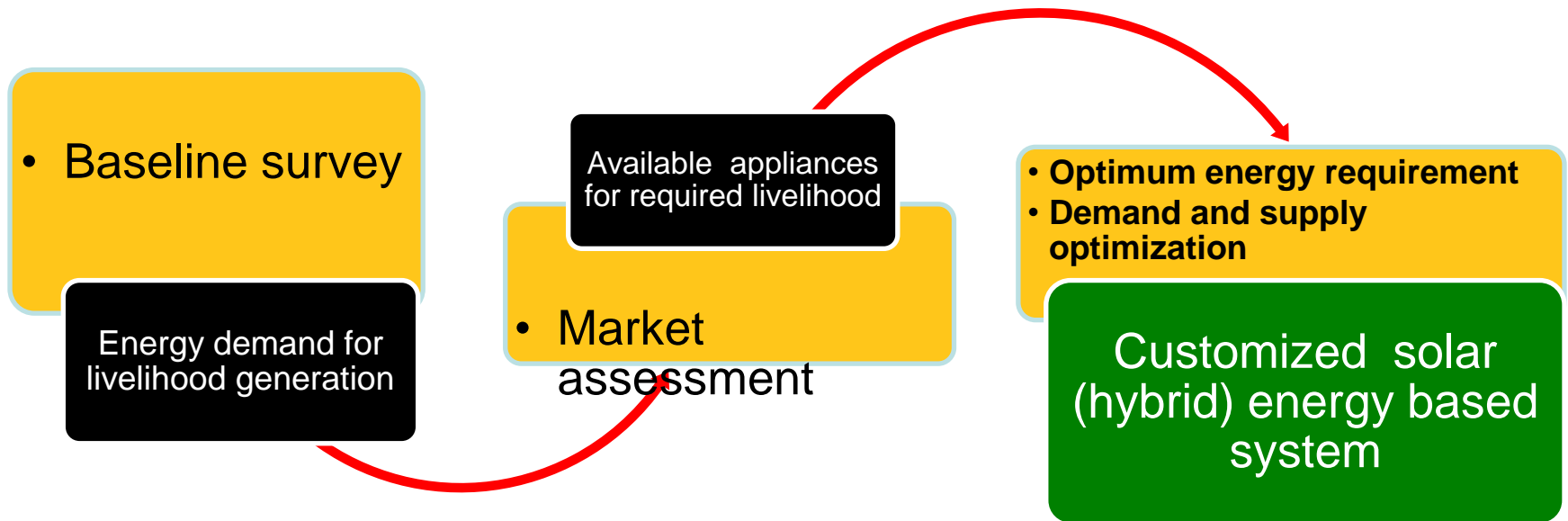
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Methodology for Technology Customization



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Methodology for impact assessment



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**Base-line survey
with measurable
indicators**



**Compare Base-line
with measurable
indicators**

**Clean energy based
technology
intervention**

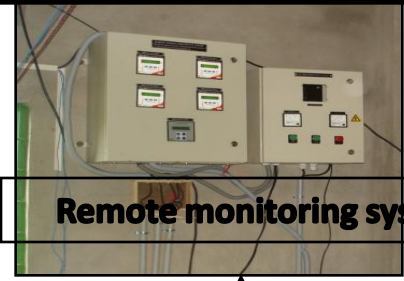
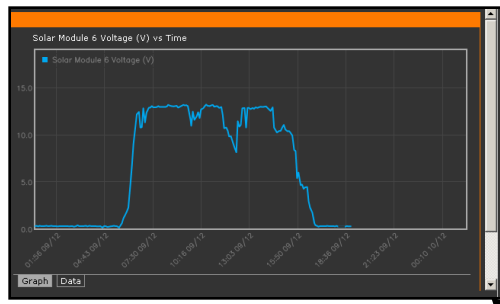
Livelihood generation activities



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- Battery charging, Mobile phone charging
- Turmeric grinding, Chilli/spice grinding
- Bamboo slicing/slivering
- Honey skimming
- Silkworm reeling,
- Jaggery production
- ICT applications

Installation of SMU



Remote monitoring system



Solar Lanterns



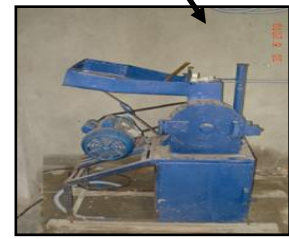
SMU



Honey extracting



Battery charger



Turmeric grinder



Bamboo splitting

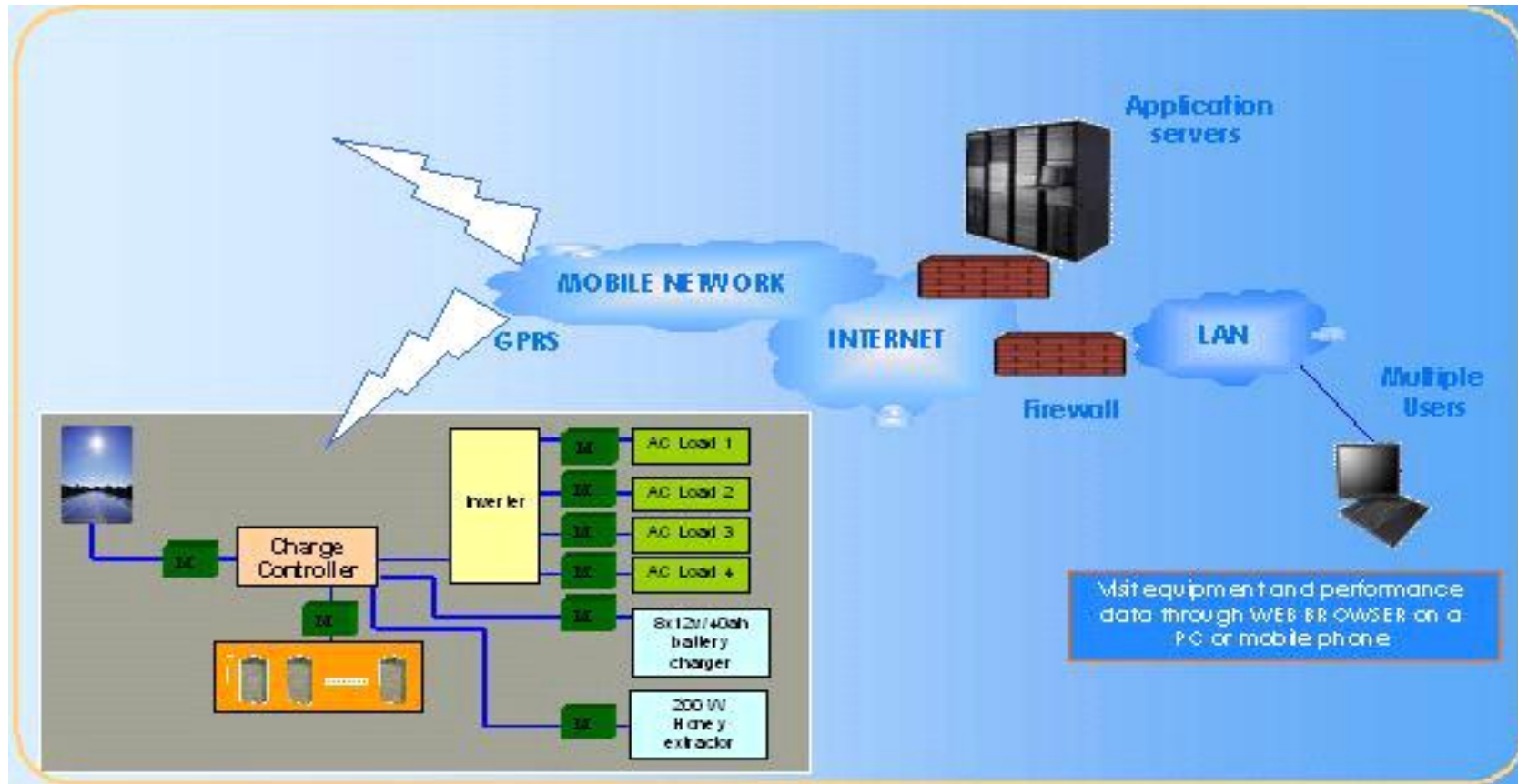


Water purifier

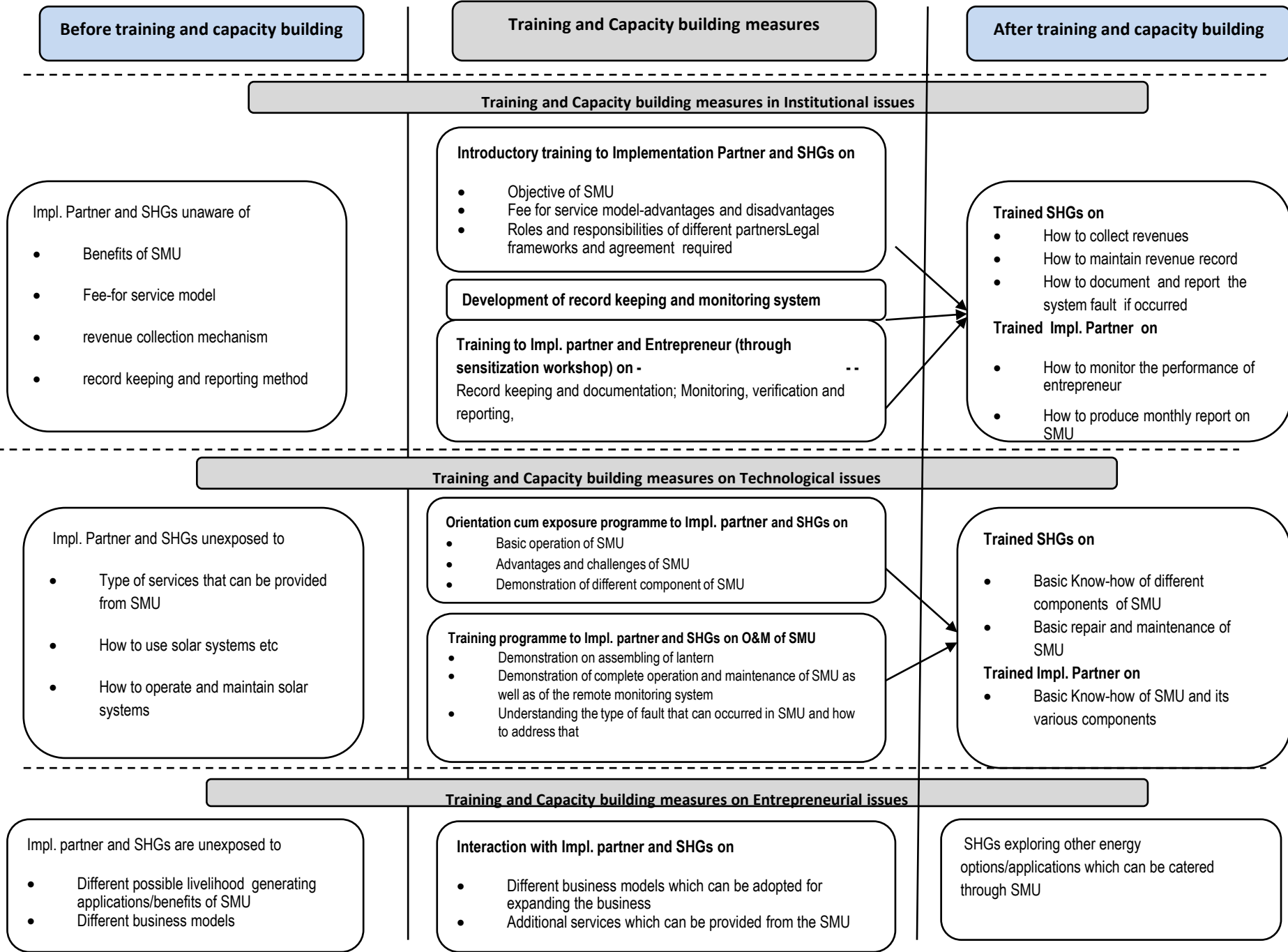
Remote monitoring mechanism for performance assessment and monitoring of the SMU



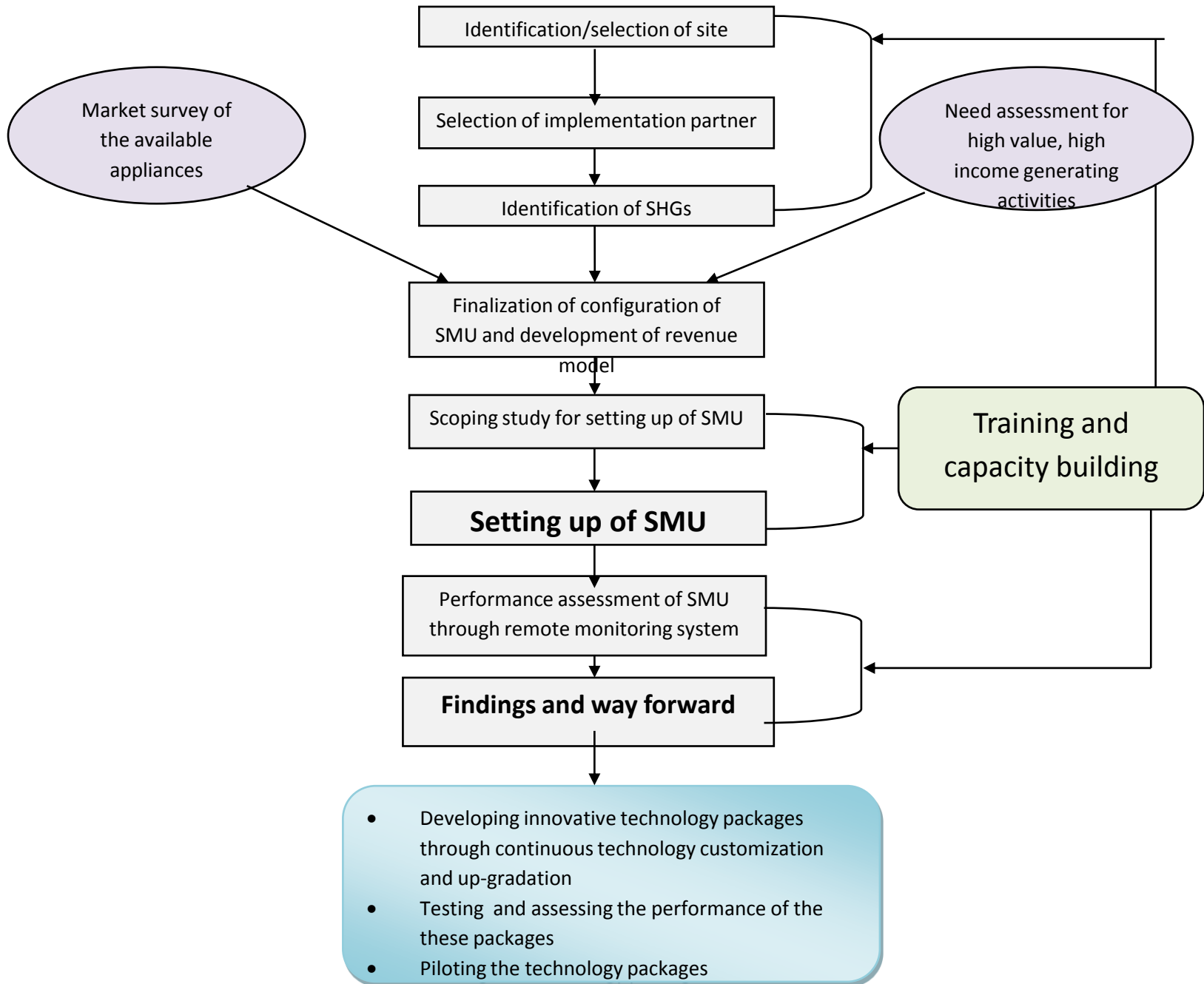
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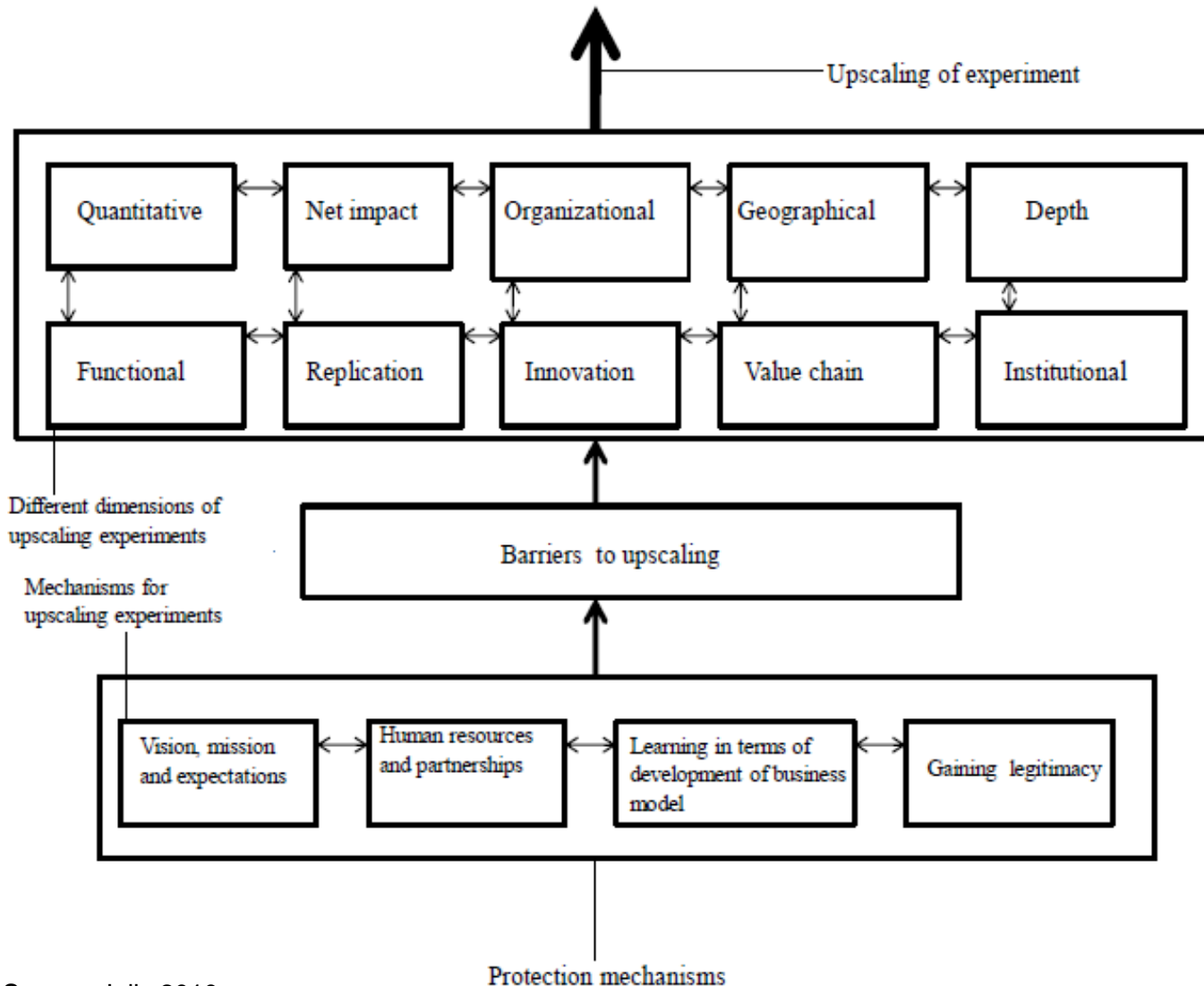
Capacity building measures and the outcomes



Major processes involved



Framework for up-scaling



- There can be no systematic tools for understanding up-scaling
- The process of up-scaling takes place at multiple dimensions and an interdisciplinary approach is key to its understanding
- Relevant research field - system of innovation, strategic management, social entrepreneurship, development studies, and bottom of pyramid literature.

Learning's on innovation and up-scaling (1/2)



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- The purpose of SMU is well accepted amongst the communities and the preliminary assessment study indicates a huge potential of up-scaling such SMU.
- Innovation is extremely necessary for up-scaling - developing innovative technology packages based on the requirements and demands of the local communities through continuous technology development and customization in most efficient and cost effective manner.
- Up-scaling for enterprises in the literature and practice as well has been focused in the past on few dimensions, mostly quantitative
- Up-scaling is primarily driven by the vision, mission and expectations of the enterprises
- Value chain upscaling i.e. moving up the value chain for enterprises requires a balancing act.

Learning's on innovation and up-scaling (2/2)



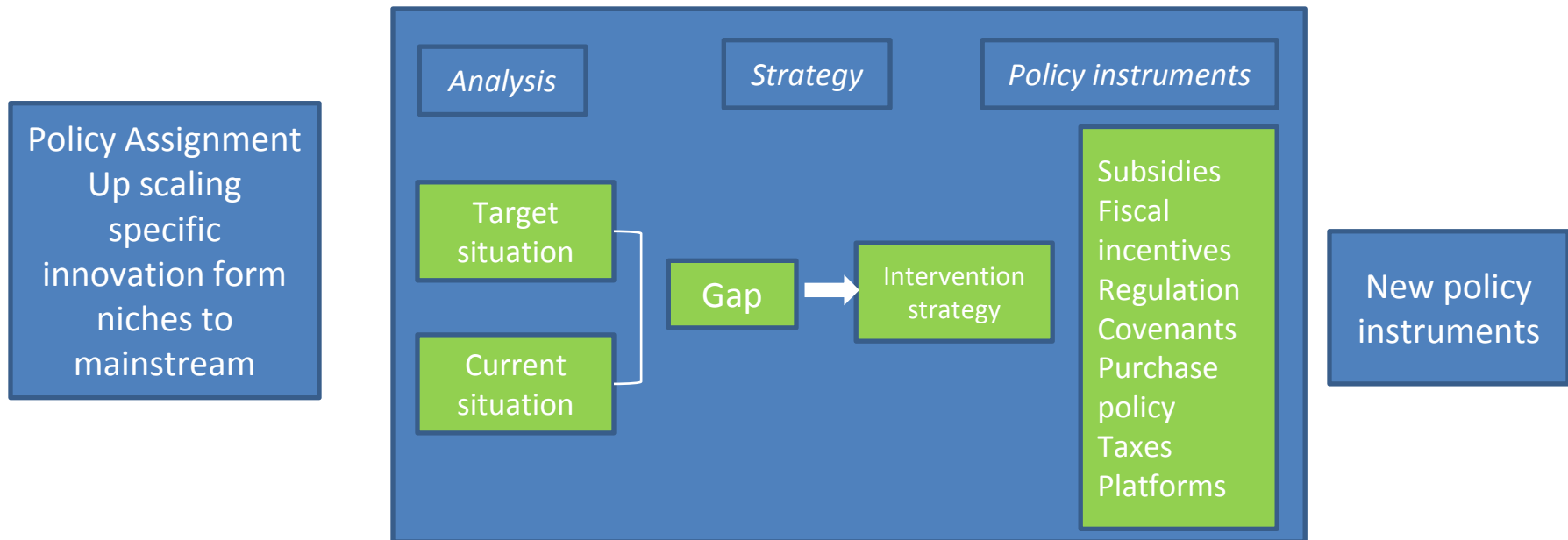
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- Up-scaling only takes place successfully when the enterprises are financially sustainable; developing a viable model requires learning in the form of double loop learning where enterprises need to develop model which are financially self sustainable and not dependent on external grants and subsidies.
- Finance plays a critical role but the important point is that it must fit with the motivation, expectations, style of working and business model of the enterprise.
- Human resources constraints during scaling up hinders expansion of social enterprises beyond a pilot stage
- Enterprises need to form partnerships with commercialization partners, distribution networks and get noticed, enhancing embeddedness into local cultural environment, certifications from international bodies, media exposure through interviews and knowledge dissemination activities and awards from professional bodies has helped gain legitimacy

Up-scaling scan for policy makers



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Source: ISandick & Oostra: Upscaling Energy Related Innovations

Thank you

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[Acknowledgment](#)

Developed under the TERI research project:

“Innovating to bring clean energy for livelihood generation in India”