

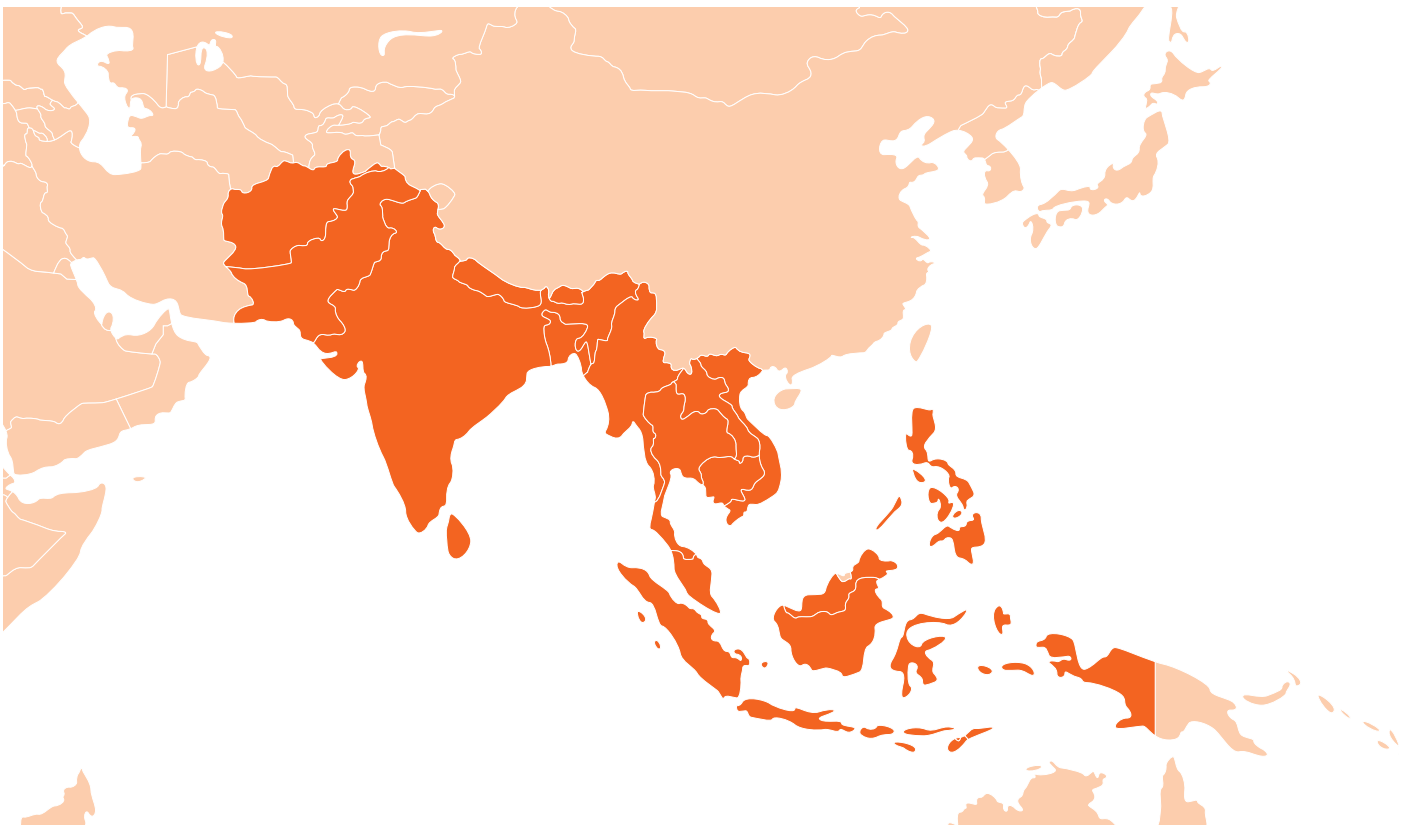


Concluding workshop for the Smart Villages Initiative's engagement programmes in South and Southeast Asia



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To conclude its engagement programmes in South and Southeast Asia the Smart Villages Initiative, in partnership with the Global Young Academy, organised a workshop on Off-grid Energy for Rural Development in Bangkok, Thailand from 7 to 9 March 2017. The Thai National Science Museum (NSM) and National Science and Technology Development

Agency (NSTDA) hosted the workshop. More than 40 key stakeholders representing the public sector, private companies, academia, civil society organisations, and entrepreneurs who are engaged in the off-grid energy sector across South and Southeast Asia gathered for the workshop.

The first day of the workshop considered the interaction between energy access and the two important issues of education and healthcare in off-grid communities. The Global Young Academy spearheaded the second day, which focused on the role of early- to mid-career scientists and academics in developing smart villages. The workshop concluded on the

third day with wrap-up discussions on the Smart Villages Initiative's engagement programmes in South and Southeast Asia.

This policy brief summarises the key messages from the workshop for policymakers, development organisations and other stakeholders.

Energy for education and health-care

Worldwide, one in three children go to primary schools without electricity, and only one in four health facilities in sub-Saharan Africa have access to electricity. Health clinics need energy for surgical operations, refrigeration, diagnostic equipment, water pumping and purification, ICT and improved connectivity, sterilisation, heating, cooling, cooking, etc. For schools, electricity is necessary for lighting, water pumping and purification, food preparation, heating, cooling, ICT and connectivity. Key messages from the workshop were as follows:

1. Clean cookstoves for reduced smoke exposure: There is a large population without access to clean cooking fuels across South and Southeast Asia, and biomass continues to be the dominant fuel. Smoke from cooking is a long-ignored health risk. However, there are still low levels of awareness about this risk. Even if improved cookstoves (ICS), which are more efficient and produce less pollution, are provided for free or for a small fee, there remain a number of barriers to their wider adoption. Many ICS projects fail to progress beyond the pilot phase. The barriers include poor design of the stoves, resistance to lifestyle changes that may be required to use ICS, and a general lack

of awareness (including among policy makers) about the health impacts of open-fire stoves.

Most households (in both rural and urban areas) resort to "fuel stacking", i.e. using more than one cooking fuel, depending on factors like what fuels are available, the food being cooked, the occasion, and the household member who is doing the cooking.

2. Raising awareness about cooking and air quality:

Air pollution is difficult to observe, but if its impact was better communicated to the general public, the cultural barriers to cleaner cooking could potentially be overcome. For example, installing air quality monitors (even temporarily) in cooking places and communicating the readings to householders in layman's terms may help.

3. Energy provision to rural healthcare centres:

Provision of healthcare services in rural areas is often a challenge because most off-grid remote villages lack suitably qualified professional human resources, appropriate medicines, and good infrastructure (for health care provision and day-to-day living). Care pathways supported by mobile phones and other forms of information and communications technology (ICT) can make an important contribution, but it takes more than technology for such pathways to work and it is not always clear how these healthcare systems will be financed. Energy access can address some of these issues by improving the capability of healthcare infrastructure (including by enabling ICT) and, indirectly, by supporting productive enterprises

that raise incomes and hence the ability of villagers to contribute towards the cost of health services. Associated initiatives are needed to increase villagers' awareness about health issues.

4. Improved connectivity and healthcare:

Most Ministries of Health are so distant from rural clinics that they are not fully aware of the clinics' operations. Low-cost access to energy and ICT connectivity can support the sharing of information within the healthcare system, for example by improving technical and financial reporting, and through remote-monitoring systems. This improved linkage and information exchange can help in gathering evidence for policy and financial planning, monitoring health outcomes, and resource planning (including developing more tailored specifications for healthcare facilities). One key outstanding challenge for ICT in health care is coming up with ways of supporting the management of non-communicable diseases, which are becoming more prevalent in developing countries.

5. Improved connectivity and education:

Energy-enabled technology can support the enhancement of the educational content available to school children in villages, which is usually lacking or out-of-date in rural areas. It is also essential for nurturing skills and awareness about technology in school children and improving the quality of teaching in most rural schools by providing an avenue for continuous learning about new technology and professional development for teachers. To ensure sustainability, projects should

value local methods of education while ensuring that education in villages will be good enough for school leavers to obtain the relevant skills to participate in the job market, locally and in the cities.

6. Education for life skills: In order to raise general awareness of the importance of education in rural areas, it is important to link education with opportunities in the village, for example by incorporating practical or life skills that are attractive to villagers, such as primary banking and marketing for local produce or services. In this way, it is possible to demonstrate the value of education to the community and get their buy-in for specific interventions.

7. Participatory intervention for healthcare and education:

Bottom-up approaches should be used to develop community-level services: engendering a sense of ownership and control by the community is critical. The community should be engaged in the specification of an intervention.

8. Energy and technology are not cure-alls: Remote rural communities in South and Southeast Asia tend to suffer from structural problems in both the health and education sectors, with challenges in adequate resourcing, manpower, and training. Off-grid energy-catalysed innovations, including the effective use of ICT, cannot be dissociated from these more general structural problems. Government guidance and regulation is needed, for example in curriculum development. As for the shortage of teachers, nurses, doctors and other front-line practitioners in rural communities, the

general lack of basic infrastructure (including roads, energy, and healthcare facilities) discourages suitably qualified individuals from choosing to work in rural areas.

9. Hardware choice: Hardware choice for technology solutions is often misguided, and servicing, maintenance, and replacement is not always factored in. There is a need to learn from the failures, including technology failures, and to realise that there are other external reasons for project failure, such as social and political issues. Governance, the rule of law, and corruption were cited as common barriers to appropriate design or specification, scaling-up, and the sustainability of most interventions.

10. Funding: Obtaining funding is generally difficult for both healthcare and education solutions, so that in the absence of big funding bodies interventions are not possible when working with governments that lack the necessary fiscal capability. Funding is as important as other policy support mechanisms. Experience indicates that villagers can make a useful contribution to the costs of education and healthcare, and using local human resource support can bring costs down.

Role and viewpoint of young scientists on smart villages

1. Energy-education-gender nexus: In order to make a village “smart” energy, education and gender need to be considered holistically, as they significantly influence each other. Many studies have shown the paramount importance of girls and women involvement (with their male

counterparts) in making a village smart and sustaining it. Education should not be limited to children: rather, schools should serve as centres for life-long learning for every member of the community.

2. Open data and knowledge:

Rural communities often hold significant amounts of traditional knowledge. Making this knowledge available to other communities, without stripping the originators of the ownership of their knowledge, is important. Similarly, using ICT, villagers can benefit from solutions and information generated elsewhere in the world and shared through the internet, though awareness of these resources is often missing. Achieving such information sharing requires intellectual property laws to be revised and adapted to current socio-technological needs, and to support emerging opportunities like Open Data and, more generally, open science and innovation.

3. Fostering engagement of scientists:

To solve global challenges like climate change and social inequalities requires the engagement of more scientists and scholars. This requires changes to education, such as in the area of methods that enable students to recognise their options and realise their potential, and to the existing science and research systems—for example, by improving the current performance evaluation systems for researchers, and funding incentives to increase the engagement of scientists across disciplines and cultures.

4. Fostering interdisciplinarity:

Since off-grid energy-catalysed

development solutions require technological innovation, entrepreneurial initiatives, and nuanced community engagement, an interdisciplinary approach is the only one that will work sustainably. However, encouraging interdisciplinarity is often challenging in the scientific community, and metrics within the global science base rarely reward it. The Global Young Academy and similar peer groups are well placed to promote interdisciplinary solutions and to encourage the creative consideration of developing world applications of cutting-edge industrialised world research products and innovations.

- 5. Leveraging the influence of science academies:** There is a clear opportunity, potentially through partnership with the world's science academies and their networks, to engage with high-level international organisations (rather than just with national and sub-national bodies) to convey key policy messages. Having support and advocacy at these high levels could be highly effective in delivering smart villages.

Energy access for rural development in South and Southeast Asia

Key findings and recommendations from the Smart Villages Initiatives' engagement programmes in South and Southeast Asia, and from presentations and discussions on day 3 of the workshop may be summarised as follows:

1. Several **crosscutting issues** emerged as critical to the success of off-grid energy initiatives for rural development, including

finance, the policy and regulatory framework, capacity building, and inclusivity:

- **Finance:** Banks remain nervous about lending to village-level energy schemes, but if the track records of companies and customer payments can be shared, the banks' confidence will increase. Moreover, governments and development agencies can help by de-risking bank loans and lowering interest rates. Funding for rural electrification projects can be derived from a range of sources, including government, the private sector, NGOs, and the community itself, and can be obtained as cash and in-kind contributions, and through crowd funding. Critical for long-term positive impacts and sustainability is that projects are undertaken with the disciplines inherent in good businesses.
- **Policy and regulatory framework:** A supportive policy framework is required with high-level political commitment that is backed up with action. National energy access plans should be clear about which areas will receive access to the main grid and by when. In addition, all actors need to take an integrated approach to rural development, which should include energy access, education, health, and clean water and sanitation. Support for entrepreneurs is essential; business incubation and advisory services are valued by them. Governments need to cut red tape for entrepreneurs. Setting and enforcing standards (e.g.

through certification) is required in order to improve the quality of products and services.

- **Capacity building:** This is necessary for those in the banking sector and governments, and for entrepreneurs and energy consumers. Companies and people living in villages need additional technical and business skills. Creating awareness more broadly of the opportunities that energy access offers is important, including income-generating opportunities. Education and training are important for the success of initiatives, but also for communities to realise that some of the solutions are in their hands, and do not depend on outside influence.

Moreover, there is a need for national governments to promote and support local leadership in interventions, since local actors often have a better understanding of the needs and demands of off-grid areas. To achieve this, it is critical to develop policies that counteract the 'brain drain' from developing countries and less developed, rural parts of these countries, where the lack of professional support and career opportunities results in educated people moving away, something that undermines local development.

- **Inclusivity:** Building markets and businesses are critical to the success of rural development: women should be involved on an equal footing to men, and initiatives need to provide opportunities to the youth. Villagers should have a stake

in their own future and make the decisions on the choice and use of new technologies. The application of technologies should be seen as potentially opening new opportunities for addressing issues such as women's and girls' rights in a more innovative manner.

2. Solar home systems and solar lights:

There have been substantial advances over the past five years. Also, appliances are becoming more efficient, including innovative DC appliances that require less energy. Pay-as-you-go (PAYG) systems have helped villagers to afford to replace kerosene light with solar lights. Third-generation solar home systems are also much lighter and more efficient. Looking ahead, improving the quality of the equipment and preventing counterfeiters from entering the market will be crucial, as will be technological developments (e.g. better batteries), creating recycling programmes, and improving solar photovoltaic (PV) technologies and appliance efficiencies, among other things.

3. Mini grids: Although there have been mini grid pilots, the core issue remains whether they can be scaled up and become financially sustainable. Generally, mini-grids have higher transaction costs than solar home systems. Many current mini-grid pilots are underperforming and there is a lack of clarity on government policy on mini-grids in most countries. Anchor loads will be necessary to help absorb the costs. Set-up and overhead costs can be decreased through bundling and standardi-

sation. There will generally need to be some form of capital cost subsidy to start a mini grid and tariffs should support sustainable revenues, depending on what villagers can afford and what governments allow operators to charge. The last resort should be subsidising operating costs.

4. Community engagement:

Mini grids will require significant community engagement to understand how people are going to use the electricity, and to ensure that they have a voice and a stake in the overall process. Engaging the community will help address the apparent market failure at the bottom of the energy access pyramid. Issues include that off-grid consumers generally (1) are not willing to pay a perceived higher tariff for a mini-grid electricity (compared to the main grid and alternative fuel sources), (2) consider mini-grids as a stop-gap or temporary arrangement (until the main grid comes), (3) often pay high prices for a service that does not meet duration or threshold consumption requirements.

5. Cooking and cookstoves: The key drivers of clean cookstoves are health risks, environmental impacts, and social benefits. If less time is spent collecting firewood, children can go to school, and women can free up time for other tasks or take a break. Culture, cooking habits and traditions strongly influence energy choices and attitudes towards new methods. Moreover, like solar lanterns and other technologies, there are viable businesses in the field of cookstoves, but

affordable financing needs to be more broadly available for both the producer companies and their customers. Ensuring that good product quality is achieved and maintained, especially for artisanal small-scale producers, is essential. There is also a need to further increase stove efficiency and reduce pollution.

6. Water-energy-food nexus: Water, energy and food are essential for human well-being and to meet the goals of sustainable poverty reduction and development. The water-energy-food nexus has proved to be one of the areas where synergies can be found. For example, water is key for food production (in the field for growing crops, and in the kitchen for preparing meals), but is also needed for other household and productive uses, and in some cases, also to generate electricity. It is therefore important to have a good understanding of the target system in order to design and implement appropriate solutions, and to ensure that they match local conditions and demands. It is also critical that projects take a holistic approach, to avoid designing interventions that address just one component and possibly have unintentional negative effects on other components of the nexus. Synergies and trade-offs must be identified and managed. For example, water use policies (including subsidies) promoting rice production in some parts of Asia have also resulted in a decrease in production of crops that require less water to grow, with far-reaching consequences for local food security.

- 7. Synergies and interdisciplinarity:** Education and healthcare are deeply linked with the economy, and they are key aspects of improving incomes and livelihoods in rural communities. There is a need to transform the current siloed approach and lack of coordination, which abounds at different scales (local, national, regional, etc.), into integrated, cross-ministry policies and initiatives that are based on a better understanding of synergies and competing interests. This requires a participatory and bottom-up approach that builds on existing practices, respects local culture and is inclusive of other development agencies, particularly the private sector. Establishment of entities that are charged with overseeing and coordinating projects, and ensuring continuity and sustainability after the end of interventions could help achieve this goal.
- 8. Resilience:** It is clear that rural development gains are hard-won but easily lost in a natural or man-made disaster. With access to energy and ICT, people can be more connected and build skills and knowledge; achieving prosperity by moving from subsistence to a life with economic margins. In Nepal's recent earthquake, the plight of those in remote villages was sometimes not known for days. Villages need robust communication systems with the outside world that are resilient in the case of a disaster. Moreover, services need to be improved, including health, lighting, and post-disaster welfare. Additionally, social capital is just as important as physical capital—that is, communities need to be able to come together to re-build and act as environmental stewards.
- On the technical side, intervention failures are typically the result of poor design and maintenance. This includes the use of materials that are not suited for the weather conditions (driven by the desire to try out new things or political expediency) and excessively high costs for operation, maintenance and revenue collection in remote and isolated areas.
- 9. Sustainable Development Goals (SDGs):** The level of ambition for Goal 7 on energy access needs to remain high, as does that for the other goals. Energy access is a key enabler of most other SDGs, and the development community should ensure that a “silo” mentality in which each SDG is addressed separately does not take over. It is also crucial to get the implementation right of Goal 17, on revitalising the global partnership for sustainable development. There is a need for better coordination, sharing of information, university collaborations, sharing experience and knowledge across sectors or fields, and evaluating development outcomes.

Notes

We aim to provide policymakers, donors, and development agencies concerned with rural energy access with new insights on the real barriers to energy access in villages in developing countries—technological, financial and political—and how they can be overcome. We have chosen to focus on remote off-grid villages, where local solutions (home- or institution-based systems and mini-grids) are both more realistic and cheaper than national grid extension. Our concern is to ensure that energy access results in development and the creation of 'smart villages' in which many of the benefits of life in modern societies are available to rural communities.

The Global Young Academy

The Global Young Academy aims to become the voice of young scientists around the world. To realise our vision we develop, connect, and mobilize new talent from six continents. Moreover we empower young researchers to lead international, interdisciplinary, and intergenerational dialogue with the goal to make global decision making evidence-based and inclusive.

The GYA provides a rallying point for outstanding young scientists from around the world to come together to address topics of global importance. As of 2014, the GYA has reached its full capacity with 200 members, leading young scientists (defined as an average age of 35 years and at the beginning of

their independent academic career). 2016 GYA has in addition to its 200 members 134 alumni. Altogether 70 countries from all continents are represented. Members are selected for the excellence of their science and their commitment to service and are serving five-year terms. The vibrancy of the GYA results from the energy of its members who are passionate about the role of science in creating a better world. The GYA is governed by an Executive Committee that reflects the diversity of its membership and is supported by a Senior Advisory Board composed of outstanding senior scientists and science managers, respectively.

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