Local energy practitioners and new forms of knowledge exchange can be change-maker in achieving SDG7

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Introduction – Background

The figures of global energy access improve, but not fast enough to achieve SDG 7 – Access to universal access to affordable, reliable, sustainable and modern energy for all by 2030 (see Figure 1).
And SE4All is right in saying that *"the renewable revolution appears to be slowing down at a time when it needs to speed up"* (SE4All, 2019). So despite the impetus of the global goal as well as the availability of appropriate and financially viable technical solutions, the implementation is still challenging.

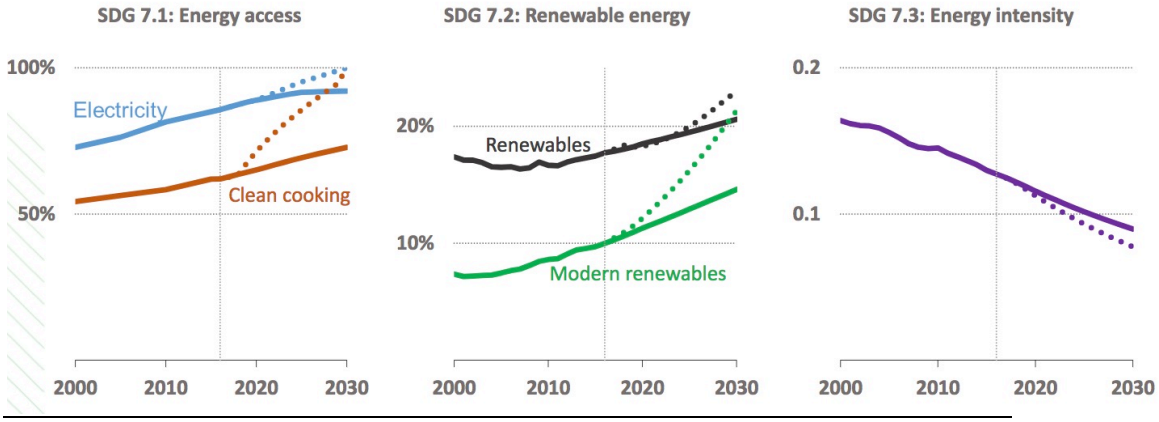

Figure 1, Under current and planned policies, the world falls short of achieving all SDG7 Targets. Source: IEA World Energy Outlook, 2017 (IEA 2018)

In the last decade, Wuppertal Institute gained experiences on how local energy transitions at the community level can be realized and which factors are key for a long-term success and real pushing of development. This was possible through an initiative that was founded 2004 and combines grants with exchange of knowledge and research (WISIONS initiative). The implicit long-term objective of these energy projects was to contribute to local energy transitions and ultimately to the achievement of sustainable development goals (SDGs).
Since the initiative's beginning, a lot has changed and the conditions for renewable energy and small-scale off-grid solutions have tremendously improved. From niche technologies promoted by some pioneers, we now see an umbrella of proven off-grid renewable energy technologies as well as several players in the field.
However, despite the technical viability of renewable energy systems, still various projects fail as they miss to embed the technology and projects in a set of actions that

address social, cultural, economic and environmental aspects. Moreover, the wealth of local practitioners and local knowledge is often underestimated and not valued enough.

Grounded on Wuppertal institute's transition research approach[1], we supervised the about 100 energy projects, but also analyzed the challenges faced as well as the aspects that decide why projects can sustain on a long-term, i.a. based on evaluation a few year post implementation (see 2).
What we in particular learned is the crucial role and importance of local energy practitioners working in regional rooted organizations. Hence, next to energy projects we actively accompanied different forms of south-south knowledge exchanges between practitioners as well as practitioner networks to strengthen the capabilities of local organizations involved in the field of sustainable (off-grid) energy solutions (see 3).

Energy Delivery Model - Key elements to sustain energy projects

In different systematic analysis and ex-post-evaluation of small-scale energy projects, we could contribute to the proof of key elements of successful and promising energy delivery models (see Fig.2) (Terrapon-Pfaff et al. 2014, 2018a,b).

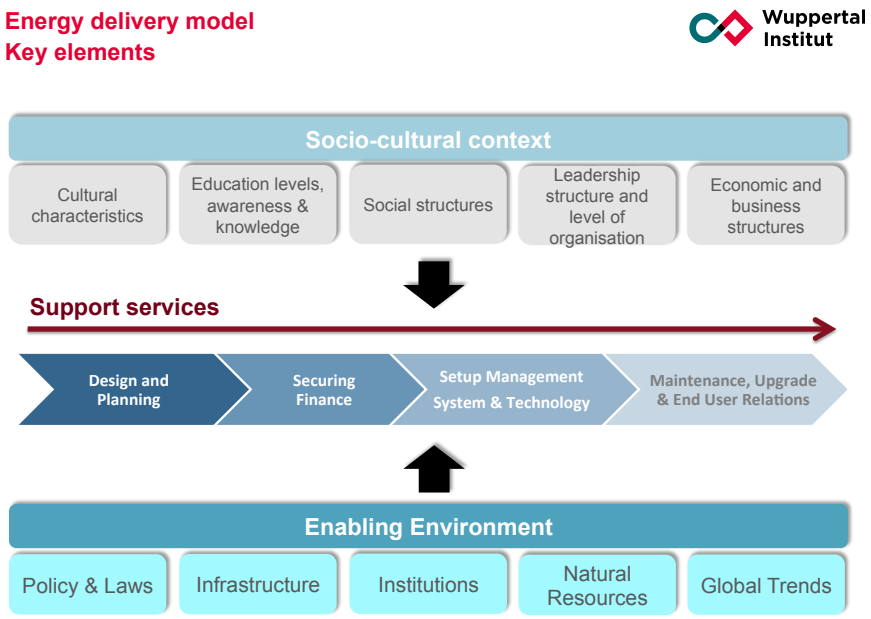

Figure 2 – Key elements of Energy Delivery Model (based on Wilson, Godfrey-Wood & Bellanca & Garside**)**

The concept of "energy delivery model" describes the crucial steps along the lifetime of a project, beyond a simple "business model" approach, from: *Design and planning – Securing finance – Technology and Maintenance* – to *Setup management system and end user relation* (see Figure 2). In Figure 3 crucial aspects to be considered in each step are lined out as well as the risks and challenges faced.

[1] Anticipate challenges (understand the system) → Inspire change & create vision → Initiate action (real-world experiment & Projects) → Facilitate implementation → Diffusion and Learning

What has becoming clear is that for most of the key aspects crucial for a sound implementation and long-term are linked to local capacities best represented by local energy practitioners - the knowledge of the local needs, conditions, availability of local capacities etc..

Design and Planning

- **Plan according to current and future needs**, consider available resources
- Planning beyond implementation and flexibility to adapt to changes is **key to sustain the system**
- *Risk/Challenge: no **feasibility check** before project start & lack of planning skills*

Securing Finance

- **Find the right financing scheme** *> challenge of high initial costs / no loan schemes / risk aversity*
- **Secure running costs, Maintenance and replacement** (e.g. batteries) *> often not considered*
- **Develop sound tarif system** and ideally a **revolving fund**
- *Risk/Challenge: high initial costs / no loan schemes / risk aversity; running costs not considered*

Technology & Maintenance

- **Choose the right technology** for the needs and purposes - no sensitive "high-tech", but suitable
- Ensure **sufficient supply** (biomass, water flow, wind, sun)
- **Ensure appropriate technical capacities** – for planning, installing, running AND maintenance
- *Risk/Challenge: incorrect installation, migration of trained stuff, technician not affordable*

Setup Management System & End User Relations

- **Capacity Building** - Train and ensure appropriate management skills for long-term
- Consider **existing community structures** - strenghtens implementation
- **Build-up trust and keep contact** to ensure trouble-shooting
- **Clarify Ownership**
- *Risk/Challenges: Poor management; low acceptance; unclear structures and ownership*

Figure 3 Key aspects to be considered in Energy Delivery Models and related risks/challenges

What is more is the fact that socio-cultural context as well as the specific regional conditions, the so-called “enabling environment” – including national policy, infrastructure, institutions, available resource etc. – are crucial elements that also decide about the success of a project (see Fig. 2).
The more these conditions are considered right from the beginning of a project - the higher are the chances for a successful implementation.

And although several projects are still failing, we could also witness in the last decade that at all levels, from local organizations, project developers up to international organizations and the political level there is an increasing understanding of the need for holistic approaches as can be seen in the quotes of the Special Report of the International Energy Agency (OECD/IEA 2017).

IEA (2017) Special report
***"…it is vital** that policy-makers engage a wide array of stakeholders, including the private sector, align government policies and objectives with local level policies and dynamics and **support capacity-building at the community level to ensure that the energy access solutions delivered are absorbed and maintained longterm**… (p.108)"*

***„Electrification strategies should be holistic**, with plans to meet the targets for household electrification **taking into account other development goals and opportunities to use energy access to stimulate economic activity**." (p.110)*

Case study – Mini-grid Game
The minigrid Game (invented by Enact) is a participatory gaming approach to allow appropriate planning according to community needs upfront to the implementation. The game was first tested in 3 Malaysian villages.
Thereby the community members partner with the project developers to design the appropriate minigrid system. In the game, the building and operating of a minigrid simulated, including design of the size the system, set affordable tariffs, designing load management. The game format increases engagement and the accessibility of the topic, but also provides experiential learning opportunities and allows to communicate upfront about possible challenges.

Productive use and sustainable economic development

Just as renewable energy projects cannot succeed without the right implementation concept / delivery model, the mantra of many project developers that *"energy leads to productive use - brings economic development – leads to improved livelihoods"* is only really the true case under specific conditions that need to be considered.
In a contribution analysis we systematically evaluated the impact pathways for the productive use of energy – based on ex-post-analysis of 30 small scale energy projects under WISIONS initiative. The **Theory-of-Change (ToC) for productive use of energy** we developed is shown in Figure 5 (Terrapon-Pfaff et al. 2018a).
In the study we lined out that (sustainable) energy access does not automatically result in productive activities, as energy is only one of the input factors required to foster socio-economic development.
Furthermore, the results demonstrate that activities, materials and information to support the productive use of energy – such as training, equipment or market research – need to be an integrated part of the energy project itself to allow for productive activities to develop on a wider scale. The key findings along the impact pathway are given in Figure 6, whereof the prior analysis of the markets and value chain as well as sufficient energy resources for the energy production (e.g. biomass) can be considered as "enabling environments".
Only sufficient supply (so-called Tier 3[2]) can stimulate economic activity, improvement of livelihoods and help fulfill other sustainability goals. This is also interesting in the light of the strongly favored Solar Home System solutions for energy access in many countries in sub-Saharan Africa and Southeast Asia.
Even if access to energy and basic needs of households can be met easily, mini-grids or other complex solutions are important for the further economic development and perspective of small and medium-sized enterprises.

[2] Tier 3: Electricity for Productive use of Energy: Power ≥ 200W, ≥ 1kWh daily capacity, ≥ 50% working hours daily (World Bank/ESMAP)

Next to the above-mentioned conditions, capacity building, financing options and business training are elements that can be embedded in the project planning.

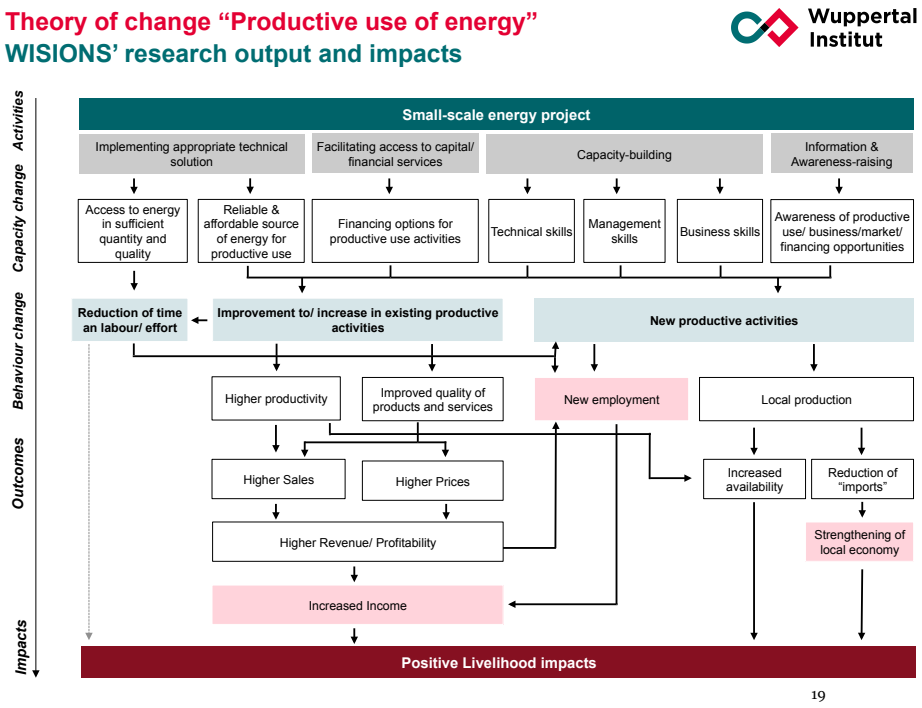

Figure 4 **Theory of Change – Productive Energy Use – Key aspects crucial to lead to positive livelihood impacts**

Case study – Business-training & Rehabilitation + of MHP in Nepal

In two different exchange projects, the operation of existing micro-hydro plants in Nepal could be sustained. The rehabilitation of 3 MHPs in Nepal led to more reliable and higher electricity production, in combination with detailed trainings on development on business, planning and management skills, the project served as incubation support to new enterprises and trigger economic development that also ensures the cost recovery for the MHP.

The second exchange project built on capacity building of MHP operators to make the MHPs commercially viable. Although in Nepal micro-hydro power generation is already widespread. Nevertheless, challenges such as poor management, weak technical skills and poor financial operation prevent community-owned micro-hydro plants (MHPs) from making a lasting impact on people's livelihoods.

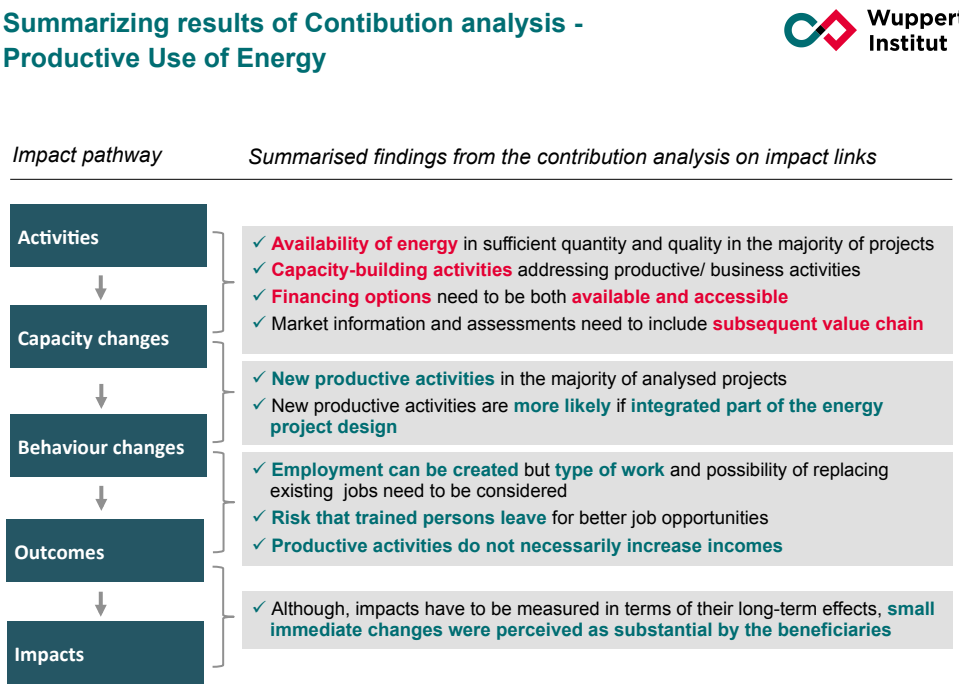

Figure 5 **Summarizing results of Contribution analysis – Productive Use of Energy**

Strength of local action – Local energy practitioners

What we in particular learned is the crucial role and importance of local energy practitioners working in regional rooted organizations. There is tremendous knowledge and expertise among the local practitioners not only on technical issues, business models and strategies for capacity building, but also on how to motivate and involve the communities to sustain the projects beyond the starting phases.
They are the key actors on the frontline of efforts to provide energy services to un-electrified and under-served areas in developing regions. These practitioners work for non-governmental organisations, as energy entrepreneurs, in energy agencies, for small and medium-sized enterprises or as independent experts. Together with associated organisations, they are based and operate in the target areas and offer a direct link to communities and end-users of the energy services.
Consequently, they are often more than simply providers of technology; ideally they should be good organizers, financial managers, problem solvers, trainers and mediators as well as good technical installers.
Their work in the field and within communities provides the practitioners with in-depth knowledge, daily lessons and hands-on training – and is riddled with challenges. At the same time, these practitioners have only limited opportunities to share their experiences with other practitioners or stakeholders such as policymakers or decision-makers.

The critical challenge is how to leverage this know-how and expertise within regions and across countries in the global South?

The UN's 2030 Agenda for Sustainable Development recognises the mobilisation and sharing of knowledge and expertise as crucial elements for supporting the achievement of the SDGs in all countries, and in the global South in particular. Of great important is enabling and improving knowledge mobilization among the energy practitioners in mutual exchange formats and in organized networks as well as in exchange with decision makers and financiers for scaling-up successful models. In recent years, this has been the aim of the WISIONS SEPS Knowledge Exchange scheme, supporting and supervising 30 exchange activities in Asia and Latin America.

Knowledge Exchanges & Practitioner networks

Knowledge exchange is a broad term, in our context i.e. the mobilisation of knowledge and expertise among energy practitioners and other stakeholders in the field of sustainable energy in the global South, with a focus on decentralised energy solutions. Exchanges can address issues such as technical challenges, financial strategies, managerial capacities, methods of motivating the local population etc.
Next to experiences from individual knowledge exchange activities of our partners - like practice-to-policy approaches or learning across projects - we also see high impact of long-term exchanges within practitioner networks. We closely cooperate since a decade with four networks, each focusing on a specific technical solution for a region. These networks have high potential to facilitate knowledge development – in their online platforms, webinars, annual gatherings, publications, but in particular in their working groups. But they also join forces to advocate for locally-rooted off-grid solutions at the political level and can foster joint research approaches. The experiences gained in the last 10 years in close cooperation with these networks will be presented, whereof various positive outcomes lead to the conclusion that with relatively low-cost activities to foster the exchange, high impact can be made that trigger a just and locally grounded energy transition in energy poor regions.

Figure 6 **Deep-dive workshop of HPNET at the Asian Development Bank to exchange between finance and Hydro Energy practitioners about social enterprise solutions**

Figure 7 **HPNET annual gathering with working groups**

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