11. THE STEPs MODEL

Sustainable Thermal Energy Service Partnerships

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STEPs
Sustainable Thermal Energy Service Partnerships

FOREWORD

Based on the research, survey and design, development and inception of a $50 million project on rural thermal energy, four building blocks of the STEPs model were identified.

These foundations to the STEPS model are keys to developing an approach to address market failures to provide thermal energy services to more than 2.9 billion people globally.

With the full ownership of stakeholders, implementation of the STEPs model and its requirements could pave the way for a paradigm shift to provide clean, safe and affordable thermal energy services for all.

- Binu Parthan, 2017.

Acronyms

5P	Pro-Poor Public Private Partnership
ASERD	Afghanistan Sustainable Energy for Rural Development
GhG	Greenhouse Gas
LPG	Liquified Petroleum Gas
STEPs	Sustainable Thermal Energy Services Partnerships
UN	United Nations

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STEPs website: http://stepsproject.net/

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1.0 – Background

The Sustainable Thermal Energy Services Partnerships (STEPs) model represents the efforts of experts and researchers spread over four continents to address a major market failure in provision of energy for cooking, space heating, water heating as well as thermal energy for industrial, commercial and public service applications in developing countries. The team of researchers have carried out research on different thermal energy service technologies such as biogas digesters, solar water heaters, efficient cookstoves, and Liquefied Petroleum Gas (LPG) to identify the various characteristics, examine successful cases and draw conclusions. The research team also examined aspects of business models, technology models, financing, policy and regulatory aspects of thermal energy services.

A global survey of thermal energy service practitioners, development agencies, civil society organisations and researchers were carried out to understand the current approaches, identify best practices and develop a strategic approach to resolving the challenge of providing universal thermal energy access. Responses were received from 30 organisations based in 17 countries but implementing and supporting thermal energy initiatives, projects and programmes in a much larger number of countries mainly focussed in Sub-Saharan Africa and Asia – two regions where the thermal energy access levels are the lowest. An overview of the Survey and outcomes is available at Annex I.

In addition to the research and the global survey, Sustainable Energy Associates also worked with and advised the United Nations (UN) to develop and implement a thermal energy services model in Afghanistan. This effort was to develop a project – Afghanistan Sustainable Energy for Rural Development (ASERD). The project which is a US$ 50 million 4-year effort has a thermal energy services model at the core and has begun implementation in January 2016, with funding from governments of Korea and Spain[1]. Design, development, validation and financing of the ASERD project have also provided the team with valuable insights from working with a national government and the UN to develop and implement a thermal energy services programme.

Based on the results of the survey, the findings of the research efforts and the development and implementation of the ASERD project, a generic model titled the STEPs model has been synthesised and is being presented in the chapter. The chapter has been developed to define with a set of requirements and guidelines that can be applied in developing countries to provide sustainable thermal energy services to households, businesses and public service institutions. The following pages present the various types of requirements of the model – technology, business and enterprise, policy & regulation and financing. A number of recommendations on requirements were identified in the areas of enterprise, technology, financing, policy and regulation. These requirements were further classified into essential and desirable requirements to ensure focus on the core requirements. The core requirements of the STEPs model were defined with 11 essential requirements whereas the complete STEPs model would see implementation of all 25 requirements, including all the 14 desirable requirements.

[1] UNDP Afghanistan, 2016, Communication on SEA support to ASERD.

All key stakeholders – governments, private sector/industry, financiers and end-users will have responsibilities within their sphere of influence to implement these requirements. Since there are existing enterprises and policy and financing environments which already have some of the recommended requirements in place, it is envisaged that the implementation of STEPs model will amount to integrating missing requirements.

2.0 – Objectives of STEPs Model

Before describing and defining guidelines for the STEPs model, it is important to specify the objectives of the approach which should act as the guiding principles. The key principles of the STEPs model are:

- The main objective would be to provide safe and clean thermal energy and to reduce the pre-mature deaths and the other adverse health effects caused by indoor air pollutants[2];
- There should be a continuous thermal energy service delivery by a service provider with a pro-poor component;
- There should be technology neutrality and should allow level playing ground for different energy sources and thermal energy conversion technologies. Wherever feasible clean energy sources should use with highest possible levels of conversion efficiencies;
- The energy applications should cover cooking, space heating, water heating at the household level as well as heat requirements of businesses and public institutions;
- The model covers the service delivery enterprises as well as the support ecosystem which include technology, financing, policy and regulation.

Inyenyeri

A Rwandan Thermal Energy Service Enterprise

Inyenyeri is a Rwandan for-profit social enterprise based in Kigali. Inyenyeri offers a service contract with households to buy fuel pellets from the company and are provided a highly efficient pellet based cookstove on a free lease. The arrangement works similar to service contracts with mobile telephony companies where the mobile phone is offered on lease upon signing a service contract.

The company offers 3 different packages with varying quantities of monthly pellet supply (30 kg, 45 kg and 60 kg) and number of stoves depending on the members in the family. Inyeneri provides delivery of pellets directly to households and offers maintenance support for cookstoves with free replacement in case of major defects. The users are also trained on the use of pellet stoves upon signing the contract.

The pellet factory is located at Gisenyi and receives biomass supplied by rural Rwandans at rural collection centres. The stoves and pellets are distributed through urban stores to over 10,000 customers. More at www.inyenyeri.com

[2] Particularly particulate Matter (PM) 2.5, Carbon Monoxide (CO) and Volatile Organic Compounds (VOCs).

There are also sustainable development aspects such as poverty alleviation and supporting households that are poor as well as mitigation of Greenhouse Gases (GhG) for climate change mitigation. We have integrated these considerations into the approach and requirements without diluting the main objective of the model and approach. The various recommendations and guidelines that have been drawn up and presented in the following pages have also been classified as Essential and Desirable as follows:

- **Essential** recommendations and guidelines denoted by **(E)** after the recommendations are the core requirements of implementing the STEPs approach and model. It is recommended that these groups of requirements and recommendations are considered critical in implementing sustainable thermal energy services irrespective of the country/location where the initiative is being implemented;

- **Desirable** recommendations and guidelines denoted by **(D)** to highlight the recommendations that are considered to be important in implementing and sustaining the STEPs approach and model. While implementation of these requirements and recommendations is encouraged, it may not be possible to implement these in all countries/locations or may not even be relevant in some contexts.

The classification of the recommendations into these two groups is made to help practitioners, project developers, development agencies, governments and regulators to prioritise and to focus efforts on the key elements of the model initially. However, where possible the maximum number of desirable recommendations should also be implemented, over a period of time.

3.0 – Enterprises

A key building block of the STEPs model is the energy service enterprise, which provides the thermal energy services. Many energy service companies currently exist providing electricity, LPG and to a lesser extent densified biomass and biofuels for thermal energy use as a service. The enterprise could be a large enterprise that serves a country or a region or a company operating through area based franchisees who deliver the energy service. The requirements and guidelines for enterprises are:

- The enterprises should be based on a service business model where the incentives exist for continuing to provide the service and increasing the customer base for the services **(E)**;

- The enterprises should cater to specific areas and monopolistic enterprises may be permitted in rural and low-income areas with appropriate policy and regulatory oversight **(E)**;

- Various service options may be adopted by enterprises such as service (electricity service, rentals etc.) or fuel sales (LPG, Biogas, densified biomass or liquid fuels) or long term equipment placement (lease, hire purchase etc.) **(E)**;

- The enterprise model by design will be pro-poor due to coverage of low-income and rural areas that are not the most commercially attractive locations. A Pro-Poor Public Private Partnership (5P) Model as discussed in WP 10 is recommended where the investment costs are shared and service costs are subsidised by the public sector and the service preferably delivered by the private sector **(D)**;

- The ownership of the energy generation or fuel extraction as well as the distribution network should be with the enterprise. Wherever possible the thermal energy conversion equipment should also be owned by the enterprise, especially while serving poor households **(D)**;

- Encourage manufacturers of thermal energy conversion systems to engage in wholesale sales to energy service enterprises and do not incentivise sales directly to end-users. There can be substantial savings through large scale procurement by the service enterprise which can significantly bring down the cost of services **(D)**;

- The enterprises can be existing enterprises that provide energy services such as electricity or fuel retail etc. or other infrastructure services like telecommunications or transport services. Such companies are likely to be able to leverage existing networks and to support thermal energy service delivery relatively easier than start-ups **(D)**.
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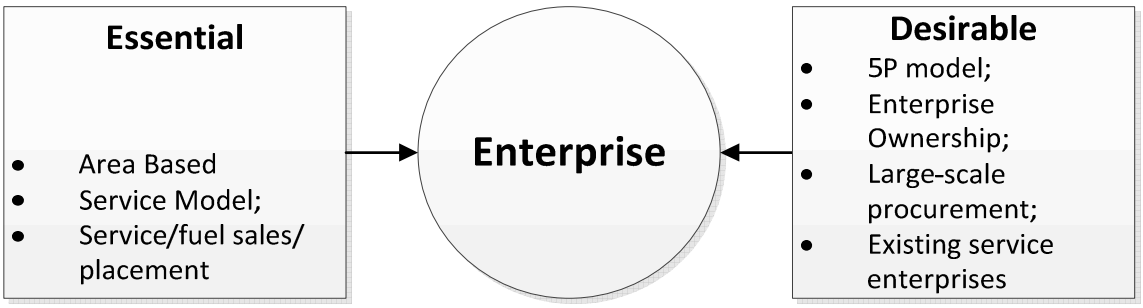
The key requirements from the STEPs model for enterprises are shown in Figure 1.

Figure 1. Enterprise Requirements



Source: all figures from B. Parthan

4.0 – Financing

An important element that is required to sustain the thermal energy service is the availability of adequate financing at the right price on a long term basis and with higher risk tolerances. The various types of financiers and financial instruments have been analysed in WP 9.

The important requirements and guidelines for financing thermal energy service are:

- Financing should be targeted at the thermal energy enterprise and not the end-users. Investment needs of enterprises for capitalisation and operation should be the basis for financing **(E)**;

- There should be a range of payment options for the services in terms of the period and frequency of the payments or in terms of the quantity of the service packages. This is particularly important for access by the poor that there are small amounts (E.g. Small volumes of fuel) retailed and frequent (E.g. daily) payments for services **(E)**;

- Financing should be based on cost recovery principles and the enterprise should be able to recover the full cost of service to be able to sustain and grow. Any subsidies should be performance based or paid directly to the consumer (E.g. direct cash transfer) **(E)**;

- Wherever possible local finance from national financial institutions and banks should be used to finance enterprise development and thermal energy service delivery to ensure sustainability. International and development finance should preferably be used to support and test innovative, first of a kind or transformational initiatives which are often challenging for local financiers **(D)**;

PAYG Cookstoves

Hire Purchase of Cookstoves through Mobile money

M-Kopa which is a major Pay-As-You-Go (PAYG) PV home system service provider in Kenya, Tanzania and Uganda. The company offers a hire-purchase of a solar home system linked to a mobile money ecosystem of M-Pesa.

M-Kopa has now extended the PAYG services to cover existing customers who would like to purchase an efficient charcoal cookstove – 'Jikokoa' from Burn Stoves. The Cookstove which costs about 50 $ is offered for a daily payment of 0.50 $. It is estimated that an urban household in Kenya saves 0.70 $/day on charcoal purchases through the use of a Burn stove. Therefore in this PAYG arrangement the household saves 0.20 $/day and is able to own the system after the cost of stove has been paid off. More information at www.m-kopa.com and www.burnstoves.com

- Use of grants and subsidies should be capped and should only be used for technical assistance and capacity building and not for buying down the initial cost of systems. Non-grant instruments such as debt, securitisation, equity, guarantees etc. should be used for capital and operations financing **(D)**;

- Where electronic finance ecosystems exist, use of mobile money or electronic payments or cryptocurrency are encouraged to leverage existing mobile network and banking coverage to reduce the transaction costs of payments resulting in lower costs **(D)**;

- There could also be models that use non-cash means like barter[3] (E.g. agro-produce or biomass) which could be relevant and applied in some locations and markets. Such options could be in addition to cash payments and could help in increased coverage of the poor **(D)**.

The key requirements for financing in the STEPs model are shown in Figure 2.

Figure 2. Financing Requirements

[3] There have been examples like in Solomon Islands where agricultural produce were bartered for energy – see Parthan, B, 2009, Solomon Islands Solar: A New Microfinance Concept Takes Root, *Renewable Energy World.*

5.0 – Technology

Different technological options for thermal energy have been examined in previous chapters. Often there is excessive emphasis placed on technologies in energy access programmes with technology solutions determined initially with business models, financing, policy and regulation aspects not being considered appropriately. While the energy source and technology are important building blocks of the STEPs model, there should not be an undue emphasis on technology. The important requirements and guidelines regarding technology for thermal energy service are:

- Thermal energy programmes and services enterprises should be technology neutral in the sense that they should offer a range of technologies to the end-users who avail of the service **(E)**;

- The important objectives for the thermal energy technology choices should be clean indoor air and safety of use and the main criteria for technology choice should be these objectives **(E)**;

- Technology choices for energy generation or fuel supply should reflect the indigenous and locally available energy sources, wherever relevant **(D)**;

- Clean, renewable and low-carbon energy technologies and efficient production and conversion technologies should be used wherever possible in line with sustainable development objectives of governments and development assistance communities **(D)**;

- Appropriateness of the technology for rural areas of developing countries and for use by poor people should be considered while making technology choices for end-users **(D)**.

Bamyan Mini-grid

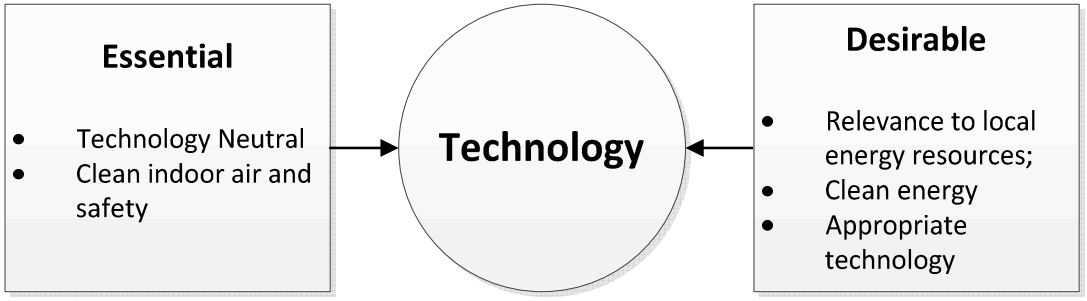
Solar-Diesel Hybrid system providing electricity and thermal energy

The solar-diesel hybrid system in Bamyan province of Afghanistan was supported by the government of New Zealand and is Afghanistan's largest. At 1.05 MW it is one of the largest solar mini-grids in the world. The average annual temperature in Bamyan is 7 C with sub-zero temperatures for 5-6 months in a year. Space heating and cooking are the major energy needs of households.

The system provides electricity for lighting and heating to several villages, a large market and government offices. The system is operated and managed by the national electricity utility Da Afghanistan Breshna Sherkat (DABS) and uses a pre-paid metering system for electricity sales. The prices for firewood increases significantly during the winter season and electric heating and cooking from the solar-diesel hybrid provides a cleaner and cost effective alternative. (Parthan, 2015)

The key requirements for technology from the STEPs model perspective are shown in Figure 3.

Figure 3. Technology Requirements



6.0 – Policy and Regulation

Policy and regulatory framework and instruments allow governments to use the legal and regulatory power vested in them to ensure safe and clean thermal energy services to their citizens. The policy and regulatory frameworks also provide the basis on which investments can be made by enterprises and can be supported through resources from the banking and financial sector. The various policy and regulatory instruments governments can use and deploy were examined in WP 10. The key policy and regulatory requirements and guidelines for the STEPs model are:

- Establish a universal service obligation for thermal energy services in the areas of the operator which will ensure that rural areas and poor households are ensured thermal energy service coverage **(E)**;

- Implement a market driven and competitive licensing framework that is technology neutral and based on long term average prices. Ensure a 5P component in the licensing framework that compensates the licensees through performance based payments and investment finance for serving rural and poor areas **(E)**;

- Establish regulations for service delivery and limit the indoor air pollution from thermal energy service delivery through regulation. Also establish technical standards and labels for thermal energy systems and devices and enforce them **(E)**;

- Establish regulations to limit the GhG gases and to limit other forms of air pollution and management of waste from energy generation and use for thermal energy (D);

- Adoption of the multi-tier matrices for cooking and space heating from SE4All into relevant national policies and regulation and obligate service provides to adhere to superior service standards (D);

- Ensure through a policy that all public institutions such as schools, hospitals, police stations as well as other government offices and establishments avail thermal energy as a service from the thermal energy service providers to ensure business model viability (D).

The key requirements for policy and regulation from the STEPs model perspective are shown in Figure 4.

Figure 4. Policy and Regulation Requirements

7.0 – Synthesis: STEPs Model

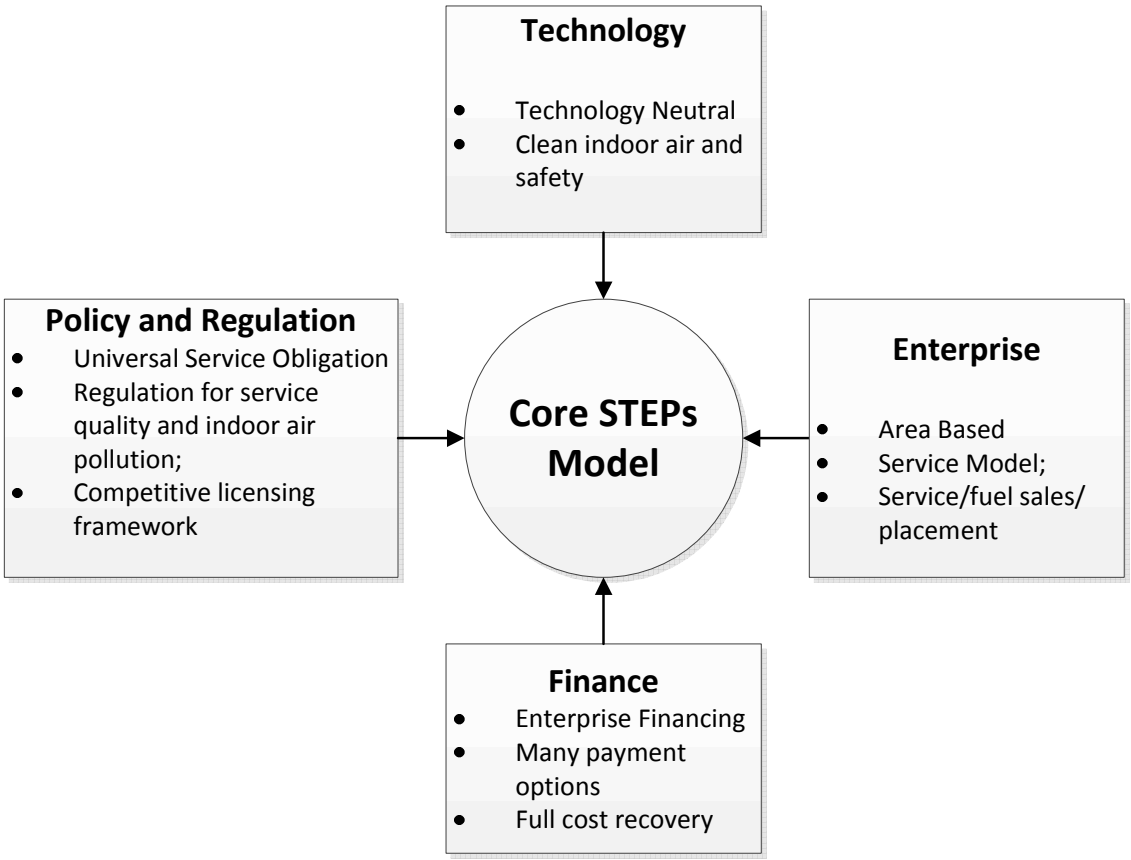
Therefore the STEPs model can be characterised by 25 requirements of which 11 are essential and the remaining 14 desirable. It is envisaged that to ensure sustainable thermal energy services that are pro-poor the essential conditions and a number of the desirable conditions will be met in all the locations.

7.1 – The Essential Requirements of the STEPs Model

The essential requirements consist of the minimum requirements in any location to ensure delivery of thermal energy services in a safe, sustainable and pro-poor manner.

The 11 essential requirements of area based and service oriented enterprises and sales, service and placement options, enterprise financing, payment options, full cost recovery, technology neutrality, clean indoor air and safety, universal service obligation, regulation of service quality and indoor air pollution and competitive licensing framework should be met as minimum requirements. Such a core STEPs model highlighting the minimum requirements is shown in Figure 5.

Figure 5. Core STEPs Model



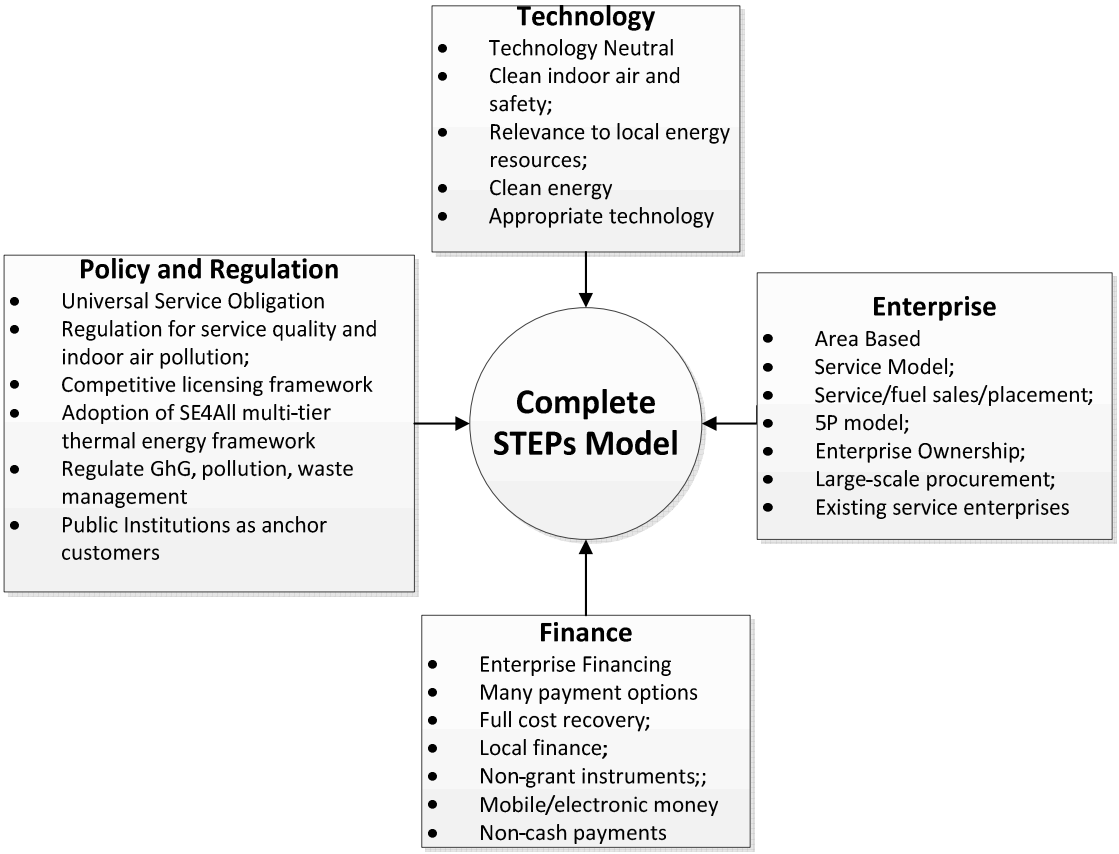
It is important to ensure that the core requirements of the STEPs model are in place for ensuring that the thermal energy services are delivered in a safe and clean manner and that the efforts are sustainable and pro-poor. The key stakeholders – governments, enterprises/private sector, financiers and the end-users from institutions and households all have important roles to play in implementing and sustaining the STEPs model.

7.2 – The Complete STEPs Model

In addition to the 11 essential requirements of the STEPs model that we can designate as the core, the 14 desirable recommendations/requirements are also important to improve the impact and sustainability. The relevance and the importance of each of these recommendations vary across countries and some of these requirements could have an importance comparable to the essential requirements in some countries. Similarly some requirements may not be very relevant in some countries.

Since the requirements have been grouped under different categories, it is encouraged that the relevant stakeholders – governments, private sector/industry, and financiers should examine the relevance of a particular desirable requirement in the socio-political and thermal energy service market context and internalise these requirements. The complete STEPs model with all the 25 recommendations or requirements is shown in Figure 6.

Figure 6. Complete STEPs Model



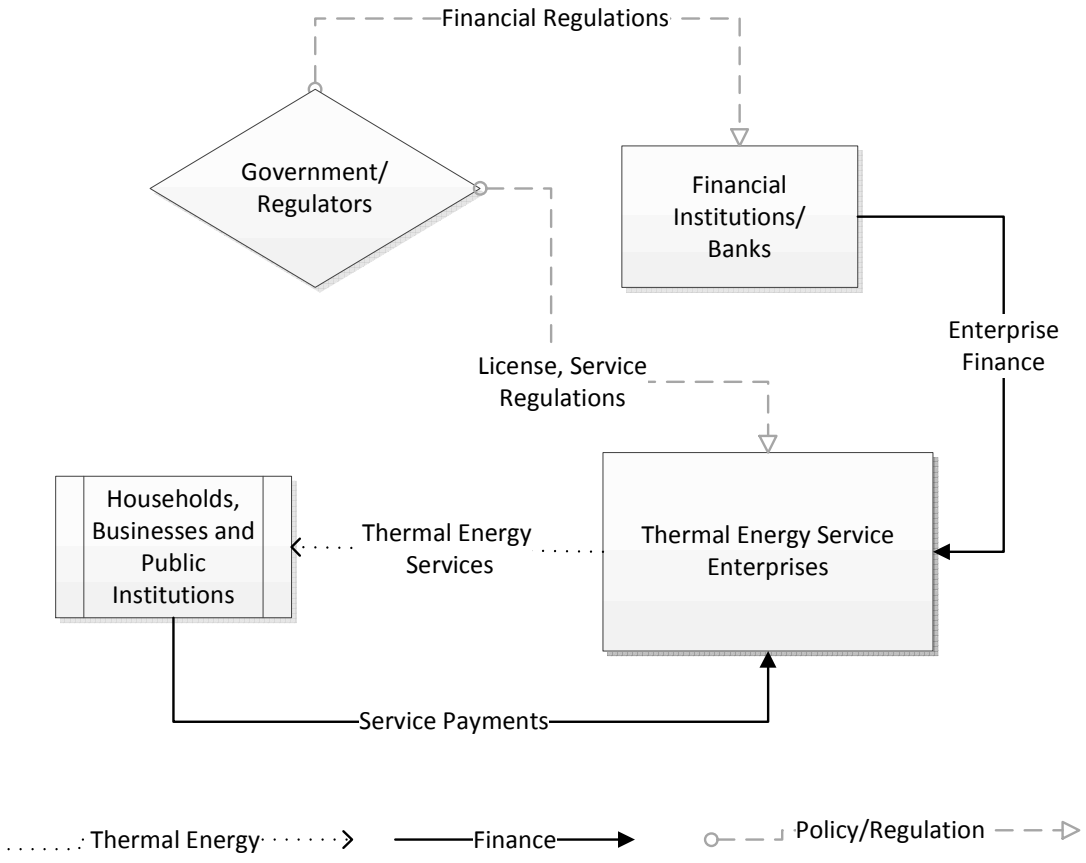
It is encouraged that all key stakeholders take a long term planning and decision-making horizon while deciding on the desirable criteria to internalise as some of the requirements will only yield results in the long term. It is encouraged that governments use their policy and regulatory powers to ensure implementation of maximum number of desirable requirements.

7.3 – The STEPs Model in Practice

The global survey carried out during the research and summarised at Annex I revealed that there were already efforts at the enterprise level which were already consistent with the core and desirable requirements of the STEPs model. Similarly the research carried out also revealed that a number of instances where governments and financiers were already implementing several core and desirable policy, regulation and financing requirements. So in the large majority of cases, the implementation of the STEPs model will involve integrating the missing requirements rather than a fully new programme.

In an implementation context it is expected that the STEPs model will work in a manner shown in Figure 7 and following the steps outlined below.

Figure 7. Operationalising the STEPs Model



- Governments establish provision of thermal energy services as a universal service obligation and put in place regulations that guarantee safe and superior quality of service and clean indoor air. These regulations would need to be developed depending on the national circumstances and the existing institutional arrangements for governance and regulation of energy;

- Governments select and license thermal energy service providers for specific areas through a competitive, market-driven process with the cost of services being the selection criteria. A number of such examples of competitive process for renewable energy power purchase exist in developing countries using auction mechanisms. Performance based financial incentives are also provided to ensure coverage of rural and poorer areas which are not attractive markets for the energy services;

- Licensed enterprises offer thermal energy services that are based on technology neutrality principles and ensure clean indoor air and safety of use to all customers in the service area. The enterprises should be able to use viable energy conversion technologies that are able to provide clean indoor air and customer safety without any prejudice against fossil fuels. Public institutions in the area of service such as schools, hospitals, police stations, government offices, places of worship etc. commit to large scale purchases and support the viability of the service enterprise;

- Most licensed enterprises have operating experience in energy, communications or transport services and can use bulk procurement of thermal energy systems and devices from manufacturers. In this manner the licensed energy service provides will be able to obtain devices at a lower price point and be able to offer systems on lease and retain the ownership of the devices during their useful life;

- The thermal energy enterprises that may offer services, fuel sales or equipment leasing or hire-purchase schemes to operate as per license in the target markets. They would also offer a variety of service payment options that could be daily, weekly or monthly and also allow for mobile money, electronic payments and barter systems based financial transactions where relevant;

- The local finance and banking system offers enterprise financing options through non-grant instruments that ensure match with the financing needs of such service enterprises and cater to their growth needs. This approach will allow for the basis of financing to be the business plan of the enterprise based on the licensed and regulated service payments and fees;

- The governments adopt international performance frameworks such as the SE4All multi-tier framework to ensure service quality and safety. The regulatory agencies also put in place regulations to use locally available energy sources, limit GHG emissions and manage waste for production and use of thermal energy by the licensed service providers.

A paradigm shift is required to ensure that sustainable, clean and safe thermal energy services are provided to 2.9 billion people who do not have access. This shift will also lead to a direct reduction in the over 3.5 million people who lose their lives prematurely due to exposure to indoor air pollution from cooking and heating. The research has shown that all the key stakeholders – governments, private sector, financiers and users can achieve these by specific actions that involve enterprise models, financing, technology, policy and regulation. These requirements have been framed in the STEPs model to encourage a multi-stakeholder approach to delivering sustainable thermal energy services for the poor.

Questions and Answers

What are the objectives of the STEPs model?

The primary objective of the STEPs model is to deliver a complete framework for the expansion of thermal energy services to poor communities around the world. These services must be delivered in a pro-poor manner, and a technology-neutral manner, allowing for a fair consideration of different energy sources and thermal energy conversion technologies. These thermal energy services should include cooking, water heating, space heating and cooling, and lighting. The model covers the service delivery enterprises and businesses, as well as the support ecosystem for these enterprises. This includes technology, financing, policy and regulation. The model also tries to integrate sustainable development considerations into the recommendations, remaining mindful of the SDGs (Sustainable Development Goals) where possible.

The model is split into essential requirements (those factors deemed necessary for the proper functioning of a Sustainable Thermal Energy Service Partnerships model) and desirable requirements (factors that would support the implementation, sustainability and applicability of the model in various contexts).

What are the essential requirements of the STEPs Model?

There are eleven requirements that are considered essential to the operation and sustainability of the STEPs model for thermal energy services. These cover the necessary measures that need to be put in place in terms of organisational structure, policy and regulatory framework, business and financial frameworks, and technology considerations, for the sustainable operation of the model. These eleven factors are listed below:

- The enterprises should be based on a service business model where the incentives exist for continuing to provide the service and increasing the customer base for the services;
- The enterprises should cater to specific areas and monopolistic enterprises may be permitted in rural and low-income areas with appropriate policy and regulatory oversight;
- Various service options may be adopted by enterprises such as service (electricity service, rentals etc.) or fuel sales (LPG, Biogas, densified biomass or liquid fuels) or long term equipment placement (lease, hire purchase etc.);
- Financing should be targeted at the thermal energy enterprise and not the end-users. Investment needs of enterprises for capitalisation and operation should be the basis for financing;
- There should be a range of payment options for the services in terms of the period and frequency of the payments or in terms of the quantity of the service packages. This is particularly important for access by the poor that there are small amounts (E.g. Small volumes of fuel) retailed and frequent (E.g. daily) payments for services;

- Financing should be based on cost recovery principles and the enterprise should be able to recover the full cost of service to be able to sustain and grow. Any subsidies should be performance based or paid directly to the consumer (E.g. direct cash transfer);
- Thermal energy programmes and services enterprises should be technology neutral in the sense that they should offer a range of technologies to the end-users who avail of the service;
- The important objectives for the thermal energy technology choices should be clean indoor air and safety of use and the main criteria for technology choice should be these objectives;
- Establish a universal service obligation for thermal energy services in the areas of the operator which will ensure that rural areas and poor households are ensured thermal energy service coverage;
- Implement a market driven and competitive licensing framework that is technology neutral and based on long term average prices. Ensure a 5P component in the licensing framework that compensates the licensees through performance based payments and investment finance for serving rural and poor areas;
- Establish regulations for service delivery and limit the indoor air pollution from thermal energy service delivery through regulation. Also establish technical standards and labels for thermal energy systems and devices and enforce them.

What are the desirable factors that can complement implementation of the STEPs Model?

There are a further fourteen factors that can be considered desirable in the implementation of the STEPs model. These factors mostly affect the ongoing sustainability of the model, and the effectiveness of the social justice components of the model: enabling businesses to operate in a more pro-poor manner, and enabling national and local governments to address thermal energy access in a pro-poor fashion. These desirable factors also cover financial arrangements for companies and organisations in greater detail, and benchmark progress according to international standards in the thermal energy service space. The fourteen desirable factors for the STEPs model are below:

- The enterprise model by design will be pro-poor due to coverage of low-income and rural areas that are not the most commercially attractive locations. A Pro-Poor Public Private Partnership (5P) Model as discussed in WP 10 is recommended where the investment costs are shared and service costs are subsidised by the public sector and the service preferably delivered by the private sector;
- The ownership of the energy generation or fuel extraction as well as the distribution network should be with the enterprise. Wherever possible the thermal energy conversion equipment should also be owned by the enterprise, especially while serving poor households;

- Encourage manufacturers of thermal energy conversion systems to engage in wholesale sales to energy service enterprises and do not incentivise sales directly to end-users. There can be substantial savings through large scale procurement by the service enterprise which can significantly bring down the cost of services;
- The enterprises can be existing enterprises that provide energy services such as electricity or fuel retail etc. or other infrastructure services like telecommunications or transport services. Such companies are likely to be able to leverage existing networks and to support thermal energy service delivery relatively easier than start-ups;
- Wherever possible local finance from national financial institutions and banks should be used to finance enterprise development and thermal energy service delivery to ensure sustainability. International and development finance should preferably be used to support and test innovative, first of a kind or transformational initiatives which are often challenging for local financiers**;**
- Use of grants and subsidies should be capped and should only be used for technical assistance and capacity building and not for buying down the initial cost of systems. Non-grant instruments such as debt, securitisation, equity, guarantees etc. should be used for capital and operations financing;
- Where electronic finance ecosystems exist, use of mobile money or electronic payments or cryptocurrency are encouraged to leverage existing mobile network and banking coverage to reduce the transaction costs of payments resulting in lower costs;
- There could also be models that use non-cash means like barter (E.g. agro-produce or biomass) which could be relevant and applied in some locations and markets. Such options could be in addition to cash payments and could help in increased coverage of the poor;
- Technology choices for energy generation or fuel supply should reflect the indigenous and locally available energy sources, wherever relevant;
- Clean, renewable and low-carbon energy technologies and efficient production and conversion technologies should be used wherever possible in line with sustainable development objectives of governments and development assistance communities;
- Appropriateness of the technology for rural areas of developing countries and for use by poor people should be considered while making technology choices for end-users;
- Establish regulations to limit the GhG gases and to limit other forms of air pollution and management of waste from energy generation and use for thermal energy;
- Adoption of the multi-tier matrices for cooking and space heating from SE4All into relevant national policies and regulation and obligate service provides to adhere to superior service standards;
- Ensure through a policy that all public institutions such as schools, hospitals, police stations as well as other government offices and establishments avail thermal energy as a service from the thermal energy service providers to ensure business model viability.

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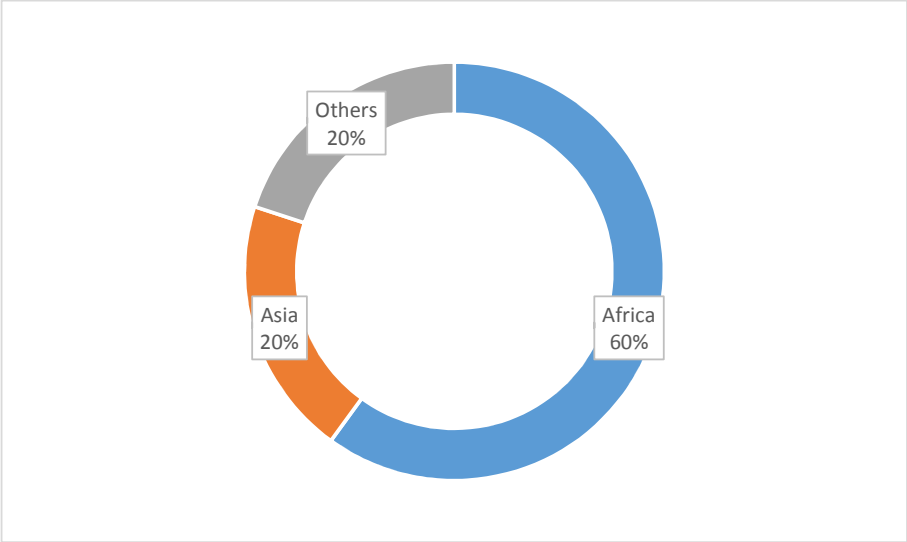
Annex I: Global Survey on Thermal Energy Services

The Survey

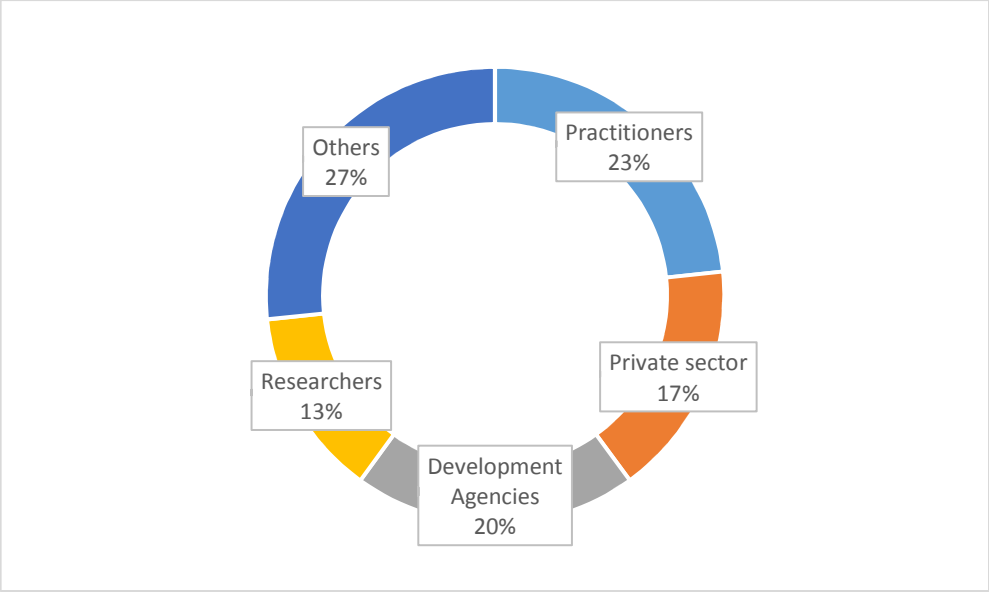
A global survey was carried out by the STEPs team during the 12-month period of August 2014 to August 2015 where invitations with questionnaires were sent out to 69 organisations covering development agencies, research institutions, private organisations, practitioners, policy makers and researchers who were either involved in developing and implementing energy access programmes or carrying out research. The geographical focus of the survey was Sub-Saharan Africa followed by Asia. The targeted set of practitioners was offered the option of filling out an online survey or a questionnaire and returning the same through e-mail. The questionnaires were followed up with phone interviews as well as site visits to elicit maximum responses from the targeted organisations and researchers. A total of 30 responses have been received which provide a good basis to characterise the various efforts at the international and local level in providing thermal energy on a service mode. The regional distribution of the respondents is shown in Figure I which shows a bias towards African respondents which was the main target region for the research projects efforts.

Figure I. Regional Distribution of Survey Responses



The responses from the respondents were fairly balanced in terms of practitioners, private companies such as manufacturers and retailers of devices, development agencies, research agencies and others such as Non-governmental organisations and partnerships that support and promote thermal energy devices of systems. This break-up is illustrated in Figure II.

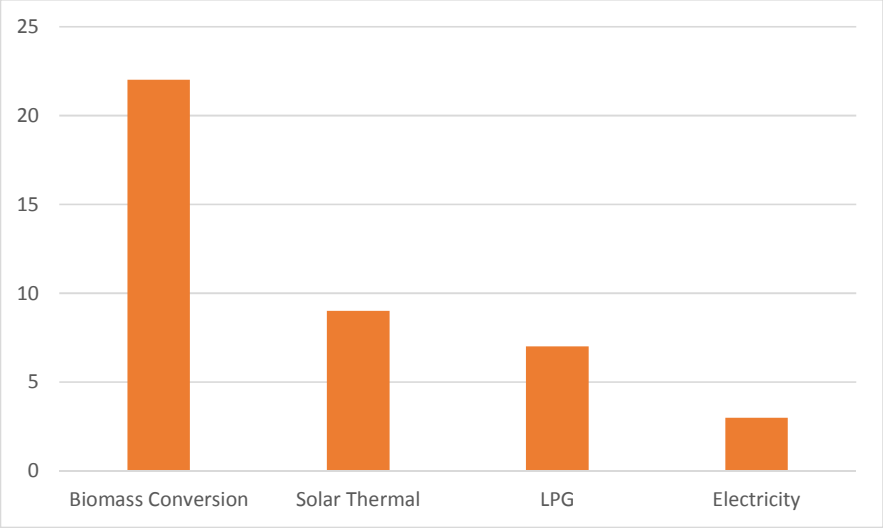
Figure II. Types of organisations that responded to Survey



Analysis and Results

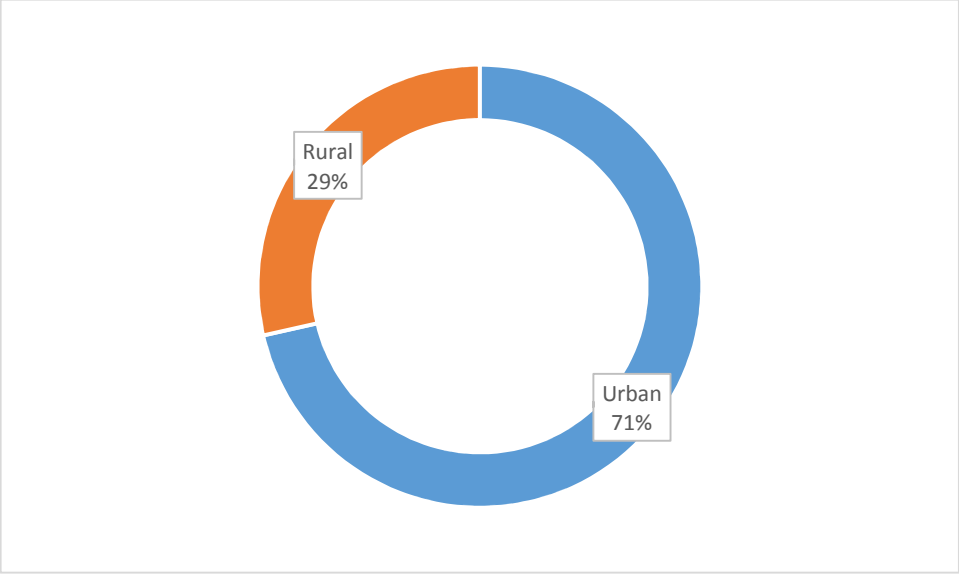
The feedback received from the survey was analysed from different aspects and the details of the results are presented in WP 1. It was noted that a number of technologies have been used or supported by the organisations to provide thermal energy which included biomass cookstoves, solar hot water and air systems, LPG and electricity. However vast majority of organisations that have responded deploy biomass cookstoves followed by solar thermal. LPG is increasingly being used for thermal energy and electricity is beginning to be used for thermal energy. These results are shown in Figure III.

Figure III. Thermal Energy Technologies Being Deployed by Respondents



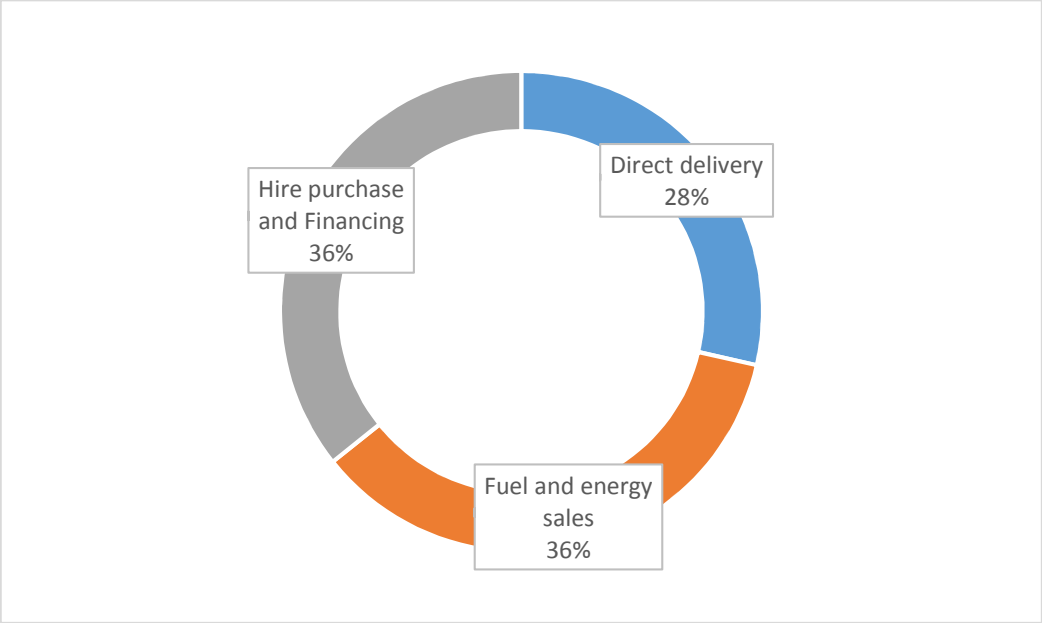
The geographical focus of operation of the service providers, practitioners, manufacturers and the product retailers were analysed. If was found that over 71% of the organisations kept their presence and focus of their operation in urban areas with only a small share of organisations with a rural area focus. This is illustrated in Figure IV.

Figure IV. Geographical Focus of Operations



In terms of the institutional, business and financial structures, three main approaches have been adopted by practitioners, service providers, manufacturers and retailers. There are direct product delivery, sales of fuels or energy over a longer period of time and finally hire-purchase and/or financing of the systems. The share of these different approaches was fairly balanced across the institutions which responded with sales of energy and fuels as well as finance/hire purchase slightly more prominent than direct product sales. This is illustrated in Figure V.

Figure V. Share of Different Institutional and Business Approaches



More details about the survey finding and a discussion and interpretation of the findings are available in WP 1.

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