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Accelerating uptake of
LPG in Maputo for
lower income
households:
**Study to support
scoping of an
intervention**

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Executive summary

THE SITUATION

In a joint publication “It is time for Gas: Why this is the ideal moment to introduce gas to the low-income families of the City of Maputo”, SNV, FUNAE and Maputo City Council identified that LPG could play a more important role in providing cooking energy to low-middle income households in Maputo.

Unlocking the latent demand for LPG at the bottom of the pyramid will potentially increase energy access in the short and medium term with significant potential co-benefits, including reducing consumption of charcoal which has a significant impact on the environment, leading to degradation of forests, as pointed to by SNV’s Problem Tree Analysis.

THE PROBLEM

Currently, LPG consumption is focused mainly at the top of the income pyramid. Investment in supply infrastructure (anticipated to come online in March 2014) will lower costs, however the latent demand at the lower end of the consumer pyramid will be inhibited due to a variety of market barriers, which include, amongst others, high transaction costs.

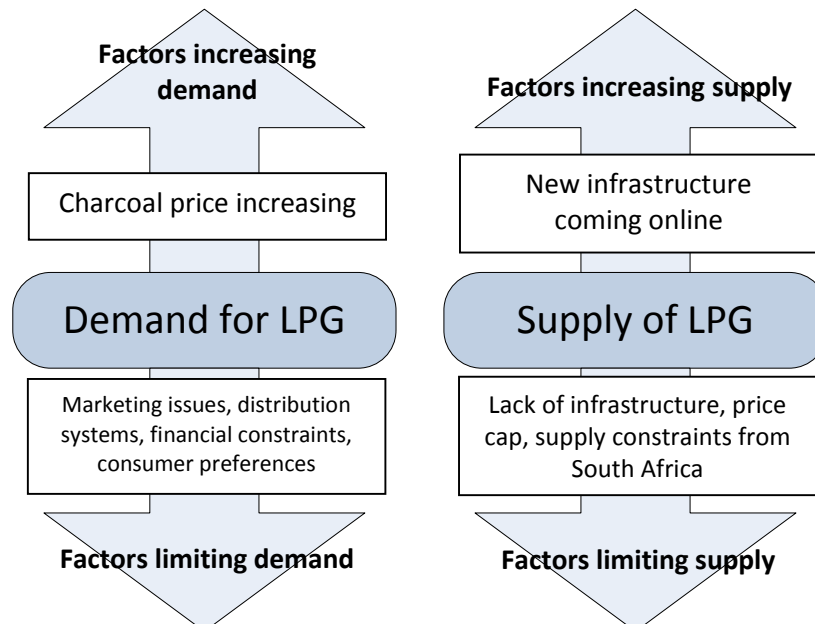


Figure 1: Summary of factors affecting supply and demand of LPG

THE QUESTION

Unlocking the latent demand at the bottom of the pyramid will potentially increase energy access in the short and medium term with significant potential co-benefits and improve distributional impacts. The key question is **what kind of intervention is required to increase the use of LPG amongst the lower end of the consumer pyramid.**

THE RESULT

To inform potential interventions, interviews were held in Maputo with a variety of practitioners in October 2013, and 4 cases were analyzed where access to LPG is promoted through business models targeting the lower parts of the income pyramid. We assessed which barriers were identified on both the supply and demand side, and what solutions were developed or could be applied to address the barriers. The barriers and solutions are summarized in the table below.

	Barrier	Issue	Potential intervention
Demand for LPG	<i>Marketing strategies not effective at reaching BoP</i>	Current distributors may not have capacity or resources for significant investment in 'soft' actions such as awareness raising.	Public information campaigns, market awareness raising and advocacy.
	<i>Strong preference from consumers for charcoal</i>		
	<i>Current distribution systems do not reach BoP</i>	Current business models are inadequate to reach lower income households.	Support for LPG supply business model innovations / investment with key actors.
	<i>Financial constraints (purchase of the new stove, cash flows of consumers)</i>	Consumers are not able to afford new equipment to switch to LPG, and cash flows do not match purchase of large bottles.	Support initiatives from private sector or microfinance initiatives. Lease options, flex finance, credit lines could also be investigated..
Supply of LPG	<i>Price cap limiting investment</i>	Price cap of LPG may limit investment in the medium-long term.	Further study into pricing of LPG for domestic cooking markets.
	<i>Lack of infrastructure</i>	Infrastructure is coming online in 2014.	Investigate feasibility of local refinery.
	<i>Supply constraints from South Africa</i>	High dependence on imports.	Investigate additional infrastructure requirements.
	<i>Natural gas piping network</i>	Natural gas piping network may be seen as fulfilling the role of LPG.	Study to clarify role of piped natural gas and LPG.

Table 1: Summary of barrier analysis and appraisal of potential interventions

The extent to which LPG can be promoted will be limited to a large degree by supply constraints. Investment in supply will improve the amount and price of LPG supplied to the market by March 2014. If 50% that currently utilise charcoal exclusively (47,900 households of 270,000 in Maputo) are provided with access to LPG, the potential increase in the market would be 1705 bottles (11kg) of LPG per day (equivalent to 18 tonnes per day), with a market value of 13.5 million USD per year. With new infrastructure coming online, supplying this increase is feasible (daily consumption in 2010 was approximately 50 tonnes/day).

As part of the study, several organisations were engaged on whether and how LPG for domestic cooking could be supported, including the Embassy of the Netherlands, Embassy of Norway, Ministry of Energy, Petromoc, Maputo City Council, FUNAE, IFC, AfDB, amongst others. Further discussions will be held with this core group, as well as other relevant organisations, in order to define an appropriate way forward, including the roles and responsibilities of the different actors.



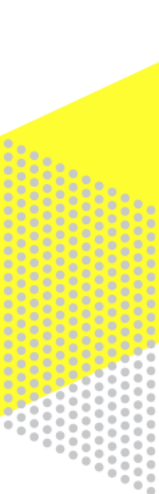
1. Introduction

In a joint publication “It is time for Gas: Why this is the ideal moment to introduce gas to the low-income families of the City of Maputo”, SNV, FUNAE and Maputo City Council identified that LPG could play a more important role in providing cooking energy to low-middle income households in Maputo. With charcoal prices increasing rapidly, increasing 260% in the last 3 years according to their study (partly due to the reduced biomass stock in southern regions), the market for LPG has become more attractive. 63% of respondents in a survey conducted by SNV in partnership with FUNAE and the city council are aware that gas is an ideal alternative for cooking, however usage rates remain extremely low, for a variety of reasons.

Having identified the potential opportunity, in order to provide a more concrete basis for the scoping of an intervention, SNV Mozambique and the Energy research Centre of the Netherlands (ECN) formed a partnership to undertake the current study to analyse the LPG sector in Maputo city.

SNV started work in Mozambique in 1996 and has played an important role in the clean cooking sector, supporting the market development for more efficient uses and alternatives to charcoal.

ECN Policy Studies provides knowledge and strategies that matter for a sustainable energy future. The 65 researchers in the unit have a back-ground in a variety of disciplines such as social science, engineering, economics and environmental sciences, and collaborate in project teams to address energy and climate policy challenges using quantitative tools and qualitative analysis.



2. Rationale and objectives of the study

Charcoal is the predominant fuel used in Maputo for domestic cooking. The extensive use of charcoal is having direct health impacts on the users (mainly women) and environmental degradation. But more concretely for the lower-middle income households of Maputo – it is getting significantly more expensive and is placing a higher burden on household budgets.

The rising costs of charcoal will create acute financial distress for households in the short term, thus ‘quick-win’ solutions are necessary. A variety of solutions exist for addressing this issue, such as those outlined in the Biomass Energy Strategy (BEST) which aim for sustainable supply of biomass through integrated development of the charcoal chain and more efficient use of charcoal resources. The efficient use of charcoal resources, such as through the promotion of improved cookstoves, is a viable solution that is already receiving significant public support. LPG, however, which also potentially can provide a cost-effective replacement (under certain conditions) for part of a household's domestic cooking needs (bringing significant development co-benefits), currently receives little public support.

According to Government of Mozambique national policies and strategies, LPG has been identified as part of energy mix going forward. LPG will be a complimentary fuel and part of the fuel supply mix, and it adds to the diversification of the energy mix. Currently, LPG consumption is focussed mainly at the top of the income pyramid. Investment in supply infrastructure (coming online in March 2014) will lower costs, however the latent demand at the lower end of the consumer pyramid will be inhibited due to a variety of market barriers, which include, amongst others, high transaction costs.

Unlocking the latent demand at the bottom of the pyramid will potentially increase energy access in the short and medium term with significant potential co-benefits and improve distributional impacts.

The key question is thus **what kind of intervention is required to increase the use of LPG amongst the lower end of the consumer pyramid.**

The specific objectives are as follows:

- Analyse whether there is a case for an intervention.
- Provide a snapshot of LPG market demand and supply and identify market barriers for further uptake at lower-middle income bracket of the period.
- Identify what kind of interventions may be possible given current ‘business models’ in place in Maputo, international examples and framework conditions.

3. Is there a case for intervention?

A public intervention in the market is usually only warranted when there is an overall benefit to society. As such, it is necessary to examine the impacts of increased LPG consumption in Maputo households. In Figure 1 below, some of the potential positive and negative impacts of increased LPG consumption are mapped onto the three dimensions of sustainable development, namely economic, social and environmental aspects.

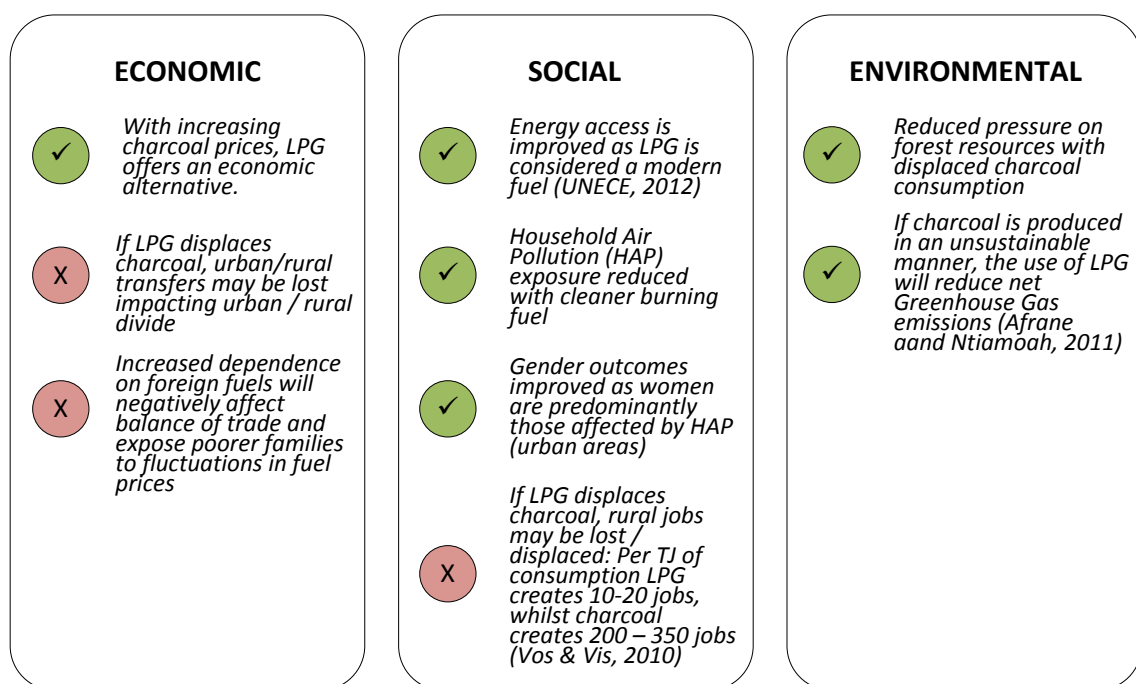


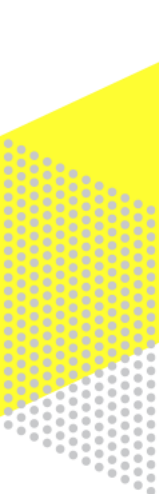
Figure 2: Sustainable development impacts of increase LPG use for domestic cooking

There is a lack of detailed quantitative evidence supporting the assessment of impacts across the three dimensions.

Atassonov (2013) provides some indications of the extent of the Household Air Pollution problem, indicating from the 61% of households cooking indoors, 19% of those said they had no windows in the kitchen area, and respiratory disease incidence within those respondents is 27% for long term persistent coughing and 16% for other respiratory illnesses.

Despite the lack of quantitative data on impacts, it can be said that the social and environmental impacts of LPG use are generally positive, whilst economic are generally negative.

This would suggest that an aggressive strategy for promoting uptake of LPG to fully or significantly displace charcoal may not be warranted. This is especially so, in light of the Biomass Energy Strategy (BEST) which outlines a roadmap for the sustainable use of biomass resources including charcoal.



Nonetheless, the BEST is still in its early stages, and taking into account the length of time that sustainable biomass solutions may require to have a real impact on the ground, LPG is an ideal bridging solution to reduce pressure on the charcoal supply . The impacts of promoting LPG will be felt in the short term (ie. 1-2 years), compared to the medium-long term for strategies proposed under the BEST. In a sense, supporting LPG is complimentary to a longer term sustainable biomass strategy.

Key messages:

- A public intervention in the market is usually only warranted when there is an overall benefit to society.
- Despite the lack of quantitative data on impacts, it can be said that the social and environmental impacts of LPG use are generally positive, whilst economic are generally negative.
- This would suggest that an aggressive strategy for promoting uptake of LPG to fully or significantly displace charcoal may not be warranted.
- Supporting LPG will have a higher impact in the short term, and can be a bridging solution to a longer term sustainable biomass strategy by reducing pressure on charcoal chain.

4. LPG in Maputo city: Demand-side and supply side considerations

4.1 LPG demand in Maputo city

The consumer, or demand side, in this analysis focusses on the consumption of LPG for household domestic use. The goal of this section is to understand the nature of the LPG market for household domestic use.

Even though from 2007-2010, LPG consumption had increased 8,4% a year on average (Mahumane, 2012), according to Atanassov (2013), who surveyed 1201 households in Maputo city, Matola city and Marracuene district, there is a heavy dependency on charcoal as a primary cooking fuel in these areas, with up to 82% of families cooking with charcoal within urban centers of the province.

The *Biomass Energy Strategy* (2012) analysed the fuel use dynamics of households in Maputo / Matola. This is shown in tables 1 and 2 below. Assuming that the sample corresponds with the actual distribution of fuel use in Maputo, this indicates of 274,193 households (INE, 2007), 95,967 households use charcoal only.¹ It can also be seen from this study that *more than half* of those people that use charcoal combine it with one or more other fuel source(s). Only 3% of the sample use LPG exclusively.

Single energy source	N	% of sample	Charcoal (Kg/day)	Firewood (Kg/day)	LPG (Kg/day)	Electricity (Kwh/day)
Charcoal	175	35	2.64			
Firewood	28	5.6		4.456		
LPG	14	2.8			0.386	
Electricity	11	2.21				2.71
Total	228	45.6				

Table 2: BEST (2012)

Two or more energy sources	N	% of sample	Charcoal (Kg/day)	Firewood (Kg/day)	LPG (Kg/day)	Electricity (Kwh/day)
Charcoal-Firewood	47	9.5	1.68	2.92		
Charcoal-LPG	95	19.2	1.84		0.39	
Charcoal-Electricity	72	14.5	2.17			1.3
LPG-Electricity	10	2			0.427	1.39
Charcoal-LPG-Firewood	3	0.6				
Charcoal-LPG-Electricity	34	6.9	2.0		0.503	0.149
Charcoal-Electricity-Firewood	7	1.4				
Total	268	54.1				

Table 3: BEST (2012)

¹ Atanassov (2013) gives slightly different values, however this variation is expected due to different samples and variations amongst the samples.

Atassanov (2013) indicated that modern fuels are price competitive with charcoal, and at times a fraction of the cost. According to Atassanov (2013), on average households pay per month 795 meticaï for the use of charcoal, while the equivalent consumption of LPG is at 659 Meticaï. The cost of using an electric stove is even lower at 364 Meticaï per month (Atassanov, 2013).²

Given the apparent economic advantage to cook with modern fuels (LPG, electricity), the high use of charcoal may seem counter-intuitive. However, there are several reasons for this.

Firstly, the cost of cooking with charcoal has increased dramatically, experiencing a 200% increase in recent years (Vignati et. Al, 2012) – as such this disparity is only a recent phenomenon. According to experts interviewed during the study, the main barriers to switching have been due to **marketing issues (consumer unaware of alternative)**, **effective distribution systems to reach the BoP (distribution)** and **financial constraints (people just have money for 1-2 days cooking)**.

The above three issues are essentially linked to a lack of **appropriate Base of the Pyramid (BoP) business models**, stemming from a lack of interest (or capacity) of companies to make available, in a convenient way, LPG for low income households.

Another reason is that there remains a **strong preference from consumers for charcoal (cultural)**. According to Atassanov (2013), charcoal stoves are considered the ideal stove by 44% of consumers.

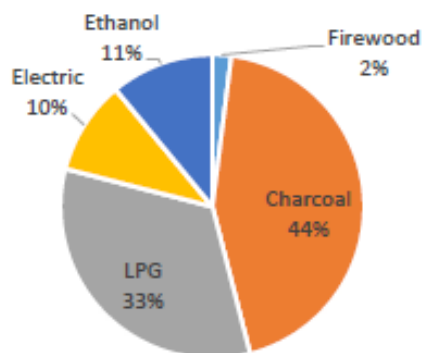
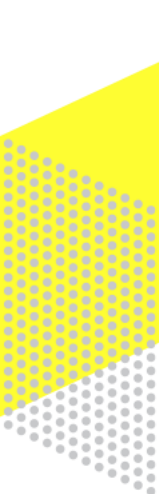


Figure 3: Ideal stove types amongst sample

There are strong indicators from surveys and anecdotal evidence that there is currently an unmet demand from consumers for increased LPG consumption. As an example, according to one distributor, there are instances of informal retailers purchasing gas bottles from the main distribution points at 652 Mt, and reselling them at 800 Mt in the lower income zones that have no access to LPG. Also, according to the BEST (2012), although LPG use has increased

² This would suggest that electric stoves could be a viable alternative also. This requires further investigation, in particular the ability of the grid to support an increase in demand.



two-fold from 8000t in 2001 to 17,000t in 2010, the per capita consumption remains low compared to other countries, further suggesting that there is an un-met demand.

In order to understand the potential size of this unmet demand in the short term, assuming that 50% of those that utilize charcoal (47,900 households) could be supported to move up the 'energy ladder' and gain access to LPG, their consumption may shift from 2.64 kg/day charcoal consumption to 1.84 kg/day charcoal and 0.391 kg/day LPG (following existing consumption patterns) with a neutral cost impact (for the consumer, excluding transaction costs). Under this assumption, the potential increase in the market for LPG would be 1705 11kg bottles of LPG per day, with a market value of 13.5 million USD per year at 652 Mt per 11kg bottle. This corresponds to approximately 18 tonnes per day of LPG (current daily consumption is approximately 50 tonnes). In terms of displaced charcoal, 13,941 tonnes of charcoal would be avoided, corresponding to approximately 69,706 tonnes of wood.

Key messages:

- There is a heavy dependency on charcoal as a primary cooking fuel in Maputo city.
- Fuel use is characterised by fuel stacking, ie. using more than one fuel type regularly.
- The two main modes of fuel use is (1) charcoal only and (2) charcoal – LPG combined.
- Due to the high price of charcoal, the choice between charcoal and LPG use is currently cost neutral.
- Marketing issues, effective distribution systems to reach the BoP, financial constraints of consumers and a strong preference from consumers (cultural) for charcoal limit uptake.
- A lack of appropriate Base of the Pyramid (BoP) business models, stemming from a lack of interest (or capacity) of companies to make available, in a convenient way, LPG for low income households, is an overarching factor.

4.2 Supply chain snapshot

In the 'demand' section, it was indicated that there is an unmet demand for LPG in Maputo city. However, the supply of LPG in Mozambique in the recent past has been characterised by several high impact events, such as a fire at a refinery in South Africa, leading many local practitioners to indicate that promotion of this source of energy would be impractical and inappropriate.

As there is no refining capacity in Mozambique (Mozambique's only LPG-producing refinery was shut in 1986 during the civil war), all LPG is imported. In the table below, the supply chain from importation to consumption is outlined, identifying the different roles, actors, a description of the role and the challenges facing that element of the supply chain.

Role	Actor(s)	Description	Challenges facing element of supply chain
Importation	Petromoc / Petrogas	<p>According to the BEST (2012) the Mozambican government has recently (May 2012) appointed Petromoc as the official importer of cooking gas (LPG - liquefied petroleum gas). Petromoc has the power to sign contracts with suppliers.</p> <p><i>Capacity to import by ship:</i> Currently there is a 1000 tonnes facility, which takes 2-3 days to offload. In March 2014 capacity will be increased to 3000 tonnes, and there will be a 50% reduction in costs</p> <p><i>By road / train:</i> South Africa itself lacks adequate physical storage space for LPG restricting its ability to store large quantities of LPG.</p>	<p>Supplying LPG (infrastructure) is capital-intensive with high front-end costs. The lack of infrastructure for LPG supply is a key barrier for up-scaling LPG use.</p> <p>As South Africa is a key supplier, the supply constraints there are also an issue.</p>
Distribution and retailing (Maputo city only)	Petrogas / GALP	<p>Distribution of LPG in Maputo is carried out primarily by PetroGAS, a subsidiary of Petromoc, and GALP. AFROX and VITAGAZ are focused on the rest of the country.</p> <p>The standard bottle size in Maputo city on the market is 11kg. However, Petrogas is introducing a new line of gas bottles of varying sizes. At present, GALP distributes only 11kg bottles.</p> <p>Government has put in place a price cap and controls the sale price of LPG.</p>	<p>Price controls aiming for more equitable access are having an unintended consequence of limiting investment needed to increase supply.</p> <p>Price controls also create shortages (as demand exceeds supply at that price)</p> <p>The introduction of smaller bottles may have more fit for low income households, enabling new distributions models, making LPG more convenient in terms of price and transport.</p>

Retailers (informal)	Resellers	Resellers purchase and then resell at a mark-up price	Consumers are paying a premium above government mandated price.
Consumers	274,000 households in Maputo city	See demand section above.	
Regulation and oversight	National Fuel Directorate in Ministry of Energy	The National Fuel Directorate in the Energy Ministry is to work with Petromoc to ensure that the new import system is correctly implemented.	Balancing pressure to keep prices low and ensuring adequate supply.

Table 4: Supply chain snapshot

It should be also noted that natural gas networks (piped natural gas) investments are taking place in Maputo, with construction of these networks already commencing. This is seen by some as an alternative to investing in supply of LPG. However, connecting poorer households will be complicated due to the informal nature of housing that characterises the majority of Maputo urban areas. It is thus likely these natural gas networks will benefit in the short term higher income households (as well as industry).

Key messages:

- Supply constraints are an issue.
- Some investment in supply will improve supply in the near future.
- Distribution of LPG in Maputo is carried out primarily by PetroGAS, a subsidiary of Petromoc, and GALP.
- The standard bottle size in Maputo city on the market is 11kg. However, Petrogas is introducing a new line of gas bottles of varying sizes, which will be critical if low income households access to LPG gas is desired
- Price controls aiming for more equitable access are having an unintended consequence of limiting investment needed to increase supply. Price controls also

5. What could be done?

It was argued above that a limited, targeted public intervention supporting LPG uptake will have positive social and environmental benefits in the short term. Taking into account demand side considerations and supply side constraints, it is clear that several barriers exist to increased uptake of LPG. Any public intervention should be oriented towards removal of these barriers, in particular those that the private sector is unwilling or unable to assume.

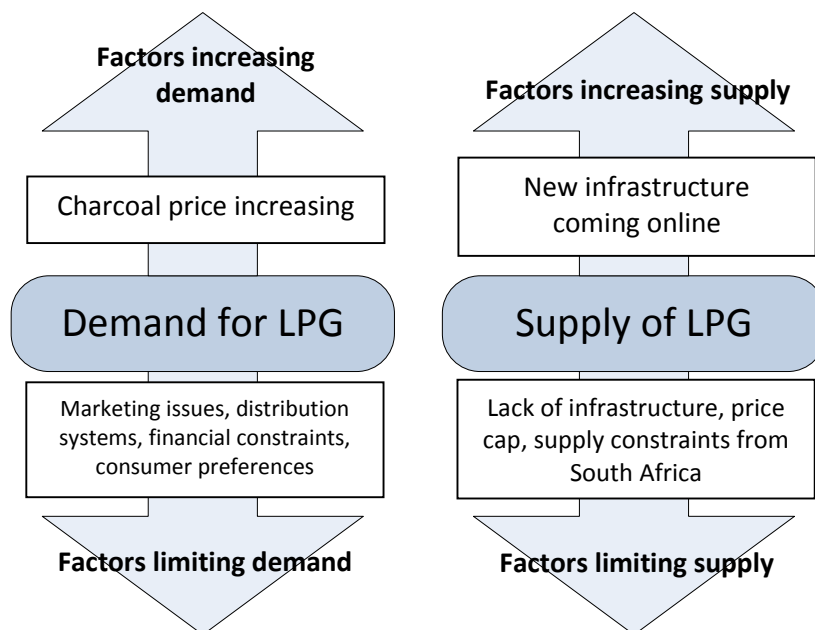


Figure 4: Summary of factors affecting supply and demand of LPG

Rather than prescribe in this study a concrete intervention, a range of potential interventions will be presented, highlighting what could be done to support LPG uptake in Maputo city. To inform these potential interventions, 4 relevant case studies have been prepared.

The four case studies include:

- Petrogas (Mozambique)
- GAVEDRA (Mozambique)
- Premier gas (Kenya)
- Vidagas (Mozambique)

CASE STUDY 1: PETROGAS, LDA

Petrogas Lda, a subsidiary of Petromoc, is a distributor of LPG in Maputo city. Petrogas is vertically integrated, and thus is also responsible for importation of LPG into Mozambique.



THE CHALLENGE...

Demand side:

Lower income households find it difficult to purchase the larger 11kg bottles due to intermittent cash flows.

Supply side:

Currently there is a 1000 tonnes facility, which takes 2-3 days to offload. The capacity is insufficient to meet demand, and associated costs are high. This is a major bottleneck in LPG supply.



THE SOLUTION

Demand side:

Petrogas has introduced to the market a variety of LPG bottle sizes, the smallest being a 4.5kg bottle. This will allow lower income households to better match the purchase of LPG with their cash flows (see below centre).

Supply side:

In March 2014 capacity will be increased to 3000 tonnes, and there will be a 50% reduction in costs. The facility will contain 3X1000 MT Mounded Bullets. Liquefied Petroleum Gas shall be stored in the Above-ground Mounded Storage Facilities (see image below left).

Although significant efforts are being pushed forward by Petrogas on the demand and supply side, working with consumers to deal with 'soft barriers' is beyond the capacity of Petrogas. They are thus looking for strategic partnerships to compliment their activities.

KEY MESSAGES

- Mozambican actors are making relevant investments in LPG supply chain.
- There is a gap in capacity of these actors to overcome specific demand side barriers.

CASE STUDY 2: GAVEDRA

GAVEDRA Mozambique, Lda, in conjunction with strategic partners such as Petrogas and the institutional support of the Mozambican Ministry of Energy, is proposing to develop a project to increase energy efficiency in Urban District DU3 Maputo City in Mozambique, by improving access to domestic gas and living conditions of households beneficiaries, with the main objective to contribute to the reduction of deforestation and forest degradation site. The specific objectives of the project will consist, therefore, in ensuring access for households vulnerable to domestic gas, facilitating their transition from unsustainable sources such as woody biomass to modern energy services, and promoting the improvement of living conditions of the beneficiary populations through the thermal insulation of the respective housing, which will render the same less vulnerable to extreme temperatures and precipitation.



THE CHALLENGE...

Transaction costs for consumers to switch to LPG can be significant. This is also true for LPG suppliers. A significant investment is required in gas bottles and associate equipment. For every gas bottle that is in the market, 2 more are needed for the refilling cycle.

Although there is evidence of an opportunity for increased sales in a profitable manner, an investment to create access to lower income households carries significant risks. Thus private actors are not yet willing to assume these risks.



THE SOLUTION

The proposed project presented by GAVEDRA aims to provide access to LPG to 14 000 households living in neighborhoods Mafalala Polana Canico "A" and Polana Canico "B" District Municipal KaMaxakene (DU3), in Maputo City, Mozambique.

In order to reach 14,000 families, 42 thousand bottles + associated stove + connections will be required (see image below centre for example of such a kit). This requires a 5-6 million USD investment.

Given the high risks, GAVEDRA and partners are seeking primarily grant financing to undertake this initiative.



KEY MESSAGES

- Private sector players have already identified an opportunity to increase LPG sales in Maputo city.
- A significant up-front investment is required to provide access to necessary equipment.
- This up-front investment is risky given uncertainty about uptake, and grant finance is being sought.

CASE STUDY 3:

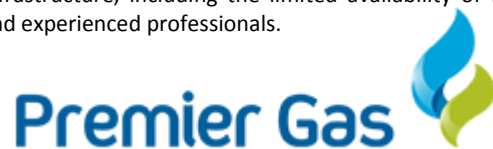
PREMIER GAS, KENYA

The typical energy mix in urban households in Kenya is dominated by Kerosene 68%, Charcoal 17%, LPG 11% and others 4%. The urban poor pay above-average prices for their energy requirements for cooking, lighting, heating and communication needs. Despite recent efforts to promote LPG by the Government of Kenya, kerosene and traditional biomass continue to dominate the household energy mix.

Premier Gas, an LPG supplier based in Kenya, supported by the International Finance Corporation (IFC), has established an innovative way to overcome the barrier of too high costs of LPG for low-middle income households in the country. In February 2012, supported by a \$2m equity investment from the IFC, the company launched Pima.

IFC's Lighting Africa program, which converts first-time users from kerosene to solar lighting, will provide advisory services to Premier Gas on consumer education on Pima and LPG usage. Premier Gas is targeting 1.4 million consumers in Kenya over the next five years. If successful, the firm will replicate Pima in other East African countries.

IFC's investment in Pima Gas was done through its *infraventures* division, created in 2008 to support innovative infrastructure projects. *Infraventures* aims to address constraints to private investment in infrastructure, including the limited availability of funds and experienced professionals.



THE CHALLENGE...

The use of Kerosene by the urban poor has continued due to the **high costs of switching** to LPG and/or lack of other suitable alternative options. The difficulties involved **with transporting and refilling LPG cylinders** of up to 13kg combined with **high initial costs** act as barriers to LPG uptake at the base of the income pyramid.



THE SOLUTION

Pima is a 1kg LPG cylinder which allows for partial refills of LPG. This approach was adopted in response to the realisation that poorer households simply could not afford to completely refill cylinders, especially since prior to the introduction of Pima the smallest cylinder on the market in Kenya was 3kg.

Pima gas is dispensed from a mobile LPG pump with an automatic switch which is activated to turn off the pump once the desired amount of gas is filled into the cylinder. Partial refills will make it easy for consumers to purchase and use LPG. The company has also already installed 15 LPG mobile units in Nairobi and plan to install a further 1000 units in the near future.

Premier Gas is exploring subsidisation options in attempt to further reduce costs to customers. Small business customers are also being encouraged to become vendors of the units by offering them safety training on the gas dispenser LPG installation.

KEY MESSAGES

- **Technology innovation and roll-out can help overcome barriers – in this case partial refill cylinders allow for consumers to match fuel purchase with uncertain and limited cash-flows.**
- **Financial support from donors is available to support such approaches.**

CASE STUDY 4: VIDA GAS, MOZAMBIQUE

VidaGas was founded in 2002 by VillageReach and its local partner in Mozambique, the Foundation for Community Development (FDC), to provide liquefied petroleum gas (propane) fuel services to rural health centers operated by the Mozambique Ministry of Health.

In its 10 year history, the company has recorded average annual growth in shipments of 35%. In addition to benefiting the health system, the company serves as a quality economic supporter in the community – today the business employs a team of 25 Mozambican employees, based in the cities of Maputo, Nampula and Pemba. In addition to supporting business demand, VidaGas is supplying a growing household market.



THE CHALLENGE.....

Access to energy in a sustainable manner remains very low in Mozambique. With no fuel refining capacity of its own, Mozambique is dependent on South Africa and other countries to supply its fuel energy needs. The share of demand for fuel is dominant in the more developed south half of the country, where there is significantly greater commercial and public activity. South Africa has been the primary supplier of fuel, with its extensive refining infrastructure. Because of historically limited supplier competition and high import costs, diesel and gasoline fuels for transport have been prohibitively expensive for many businesses and homes in the north. Periodic supply constraints have also forced the Mozambique government to diversify its importers. And while Mozambique subsidizes the cost of fuel, many rural and urban communities continue to face challenges in accessing sufficient supplies of energy due to transport distances of as much as 1,000 miles from south to north.



THE SOLUTION

VidaGas is unique in its approach to serving customers. The company is the only facilities based supplier of propane in northern Mozambique, applying three 23 ton capacity filling plants in Pemba (est. 2002), Nampula (est. 2010) and Zambezia (est. 2012) to serve its customers. While alternative propane suppliers load cylinders in Maputo City and transport the cylinders as much as 1,000 miles to their outlets (primarily gasoline stations), VidaGas' filling plants enable the company to be significantly more flexible and attentive to fluctuating customer demand, responding quickly to customer requests for additional supply. Large container transporters supply the filling plants on a regular schedule; the gas is re-filled into 5.5kg, 11kg and 45kg cylinders for distribution to retailers, small and large enterprises, and various public sector customers, including the Ministry of Health. Other propane suppliers commonly import used stocks of cylinders. VidaGas purchases only new cylinders for its business.



VidaGas Transporter & Filling Plant

KEY MESSAGES

- Supply chain innovation is a useful approach in overcoming some of the constraints faced.
- There is also strong demand in more isolated and rural areas of Mozambique.

Given the above case studies, some potential interventions can be outlined in order to inform the scoping of an intervention amongst the different actors moving forward. The potential interventions will focus specifically on the barriers identified earlier.

	Barrier	Issue	Potential intervention
Demand for LPG	<i>Marketing strategies not effective at reaching BoP</i>	Current distributors may not have capacity or resources for significant investment in 'soft' actions such as awareness raising.	Public information campaigns, market awareness raising and advocacy.
	<i>Strong preference from consumers for charcoal</i>		
	<i>Current distribution systems do not reach BoP</i>	Current business models are inadequate to reach lower income households.	Support for LPG supply business model innovations / investment with key actors.
	<i>Financial constraints (purchase of the new stove, cash flows of consumers)</i>	Consumers are not able to afford new equipment to switch to LPG, and cash flows do not match purchase of large bottles.	Support initiatives from private sector or microfinance initiatives. Lease options, flex finance, credit lines could also be investigated.
Supply of LPG	<i>Price cap limiting investment</i>	Price cap of LPG may limit investment in the medium-long term.	Further study into pricing of LPG for domestic cooking markets.
	<i>Lack of infrastructure</i>	Infrastructure is coming online in 2014.	Investigate feasibility of local refinery.
	<i>Supply constraints from South Africa</i>	High dependence on imports.	Investigate additional infrastructure requirements.
	<i>Natural gas piping network</i>	Natural gas piping network may be seen as fulfilling the role of LPG.	Study to clarify role of piped natural gas and LPG.

Table 5: Barrier analysis



Key messages:

- Any public intervention supporting LPG uptake should be oriented towards removal of market barriers, in particular those that the private sector is unwilling or unable to assume.
- Several case studies exist that provide a basis for scoping interventions. Some of the insights include:
 - Private sector players have already identified an opportunity to increase LPG sales in Maputo city.
 - Mozambican actors are making relevant investments in LPG supply chain.
 - There is a gap in capacity of these actors to overcome specific demand side barriers.
 - A significant up-front investment is required to provide access to necessary equipment. This up-front investment is risky given uncertainty about uptake, and grant finance is being sought.
 - Technology innovation and roll-out can help overcome barriers – in this case partial refill cylinders allow for consumers to match fuel purchase with uncertain and limited cash-flows.
 - Supply chain innovation is a useful approach in overcoming some of the constraints faced.
 - Financial support from donors is available to support such approaches.
- Concrete interventions such as market awareness raising, advocacy, mobilisation of grant finance for projects and further studies can help overcome some of the identified barriers.

6. Next steps

It can be seen from the potential interventions list that a variety of organisations will be required to address the multitude of barriers facing increased uptake of LPG in Maputo city. As part of the study, several organisations were engaged on whether and how LPG for domestic cooking could be supported (see below). Further discussions will be held with this core group, as well as other relevant organisations, in order to define an appropriate way forward, including the roles and responsibilities of the different actors. SNV, ECN and the Embassy of the Netherlands in Mozambique, are ready to lead this process.



Kingdom of the Netherlands



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