The Broken Links of West-Nile's Sanitation Supply Chain:

Who will be the welder?

A study on the local private sector, and the potential solutions it could offer to improve the sanitation supply chain in the Arua district of Uganda.

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Master Thesis International Development Studies
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Abstract

The Government of Uganda wants to Achieve 100% safe water coverage and 100% sanitation coverage in urban areas by 2015, and 95% sanitation coverage in the rural areas in the same timeframe. These goals have not been met and the current levels of sanitation sit around 34%. Various methods of educational programs, international cooperation, policy implementation, and private sector participation have been attempted to raise the low levels of sanitation in Uganda since her independence. Yet, these solutions have only had meteoric success, with most of the results occurring in the urban centers of the country. The rural areas of Uganda have the lowest rates of sanitation in the country, and state participation in alleviating these dismal rates are few and far between. The local private sector may be key in filling in the gaps left by weak state interventions, and could bring improved sanitation to the more remote areas of the country. This paper explores the possibilities that the local private sector could offer in enhancing the sanitation supply chain so that solutions to rural sanitation coverage can be formulated in both policy and practice.

Acknowledgments

I am pleased to present my thesis on the role of the local private sector in improving the sanitation supply chain. This thesis is the culmination of four months of fieldwork in the Arua district of Uganda as well as four months of analysis and compilation in Utrecht, The Netherlands as part of the graduation assignment of the Master in International Development Studies program in the faculty of Geosciences at Utrecht University. The research for this thesis was hosted by SNV Uganda's West Nile branch along with the SNV branch in Kampala.

With this thesis I hope to shed some light on the issues associated with the current sanitation supply chain in the rural areas of Uganda, and discover if the local private sector can improve this supply chain so that access to improved sanitation can be more readily available in the rural areas of Arua, and beyond. This thesis would not have been possible without a multitude of individuals and organizations that were instrumental in assisting and guiding me through the sometimes perilous world of academia and research.

I must first thank my supervisor Guus van Westen who guided me both in the classroom and in field with support and critical advice in the most trying moments of the program. I also very grateful towards the staff and supervisors I had the pleasure of working with at SNV in Uganda. I want to thank Rinus van Klinken at SNV Kampala for assisting me in both my research and adaption to life in Uganda, as well as Dennis Lakwo Odong and Lillian Nabasirye at SNV Arua for their advice, leadership, and wisdom.

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I would also like to express my deepest gratitude towards all of the LCBs and NGO staff that supported this research along the way including, but not limited to; CEGED, Water for People, CEFORD, and Caritas. These organizations assisted in identifying the respondents, villages, and parishes that were critical to the completion of the research, while also offering priceless advice and leading me through the vast area of Arua. I also must thank all of the respondents from all around Arua district who invited us into their homes and lives, and offered their time and thoughts in the cause of understanding.

Finally I must thank my parents and family, as without them, none of this would be in any way possible. Thank you for supporting me in every way imaginable, but most of all, thank you for encouraging me to follow my dreams in the realms of life, education, and in the pursuit of happiness.

-Steven Cole Vardeman

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List of Abbreviations

CARITAS: Congregations around Richmond Involved To Assure Shelter

CEGED: Centre for Governance and Economic Development

GDP: Gross Domestic Product

GoU: The Government of Uganda

JMP: Joint Monitoring Project

LCB: Local Capacity Builder

MDG: Millennium Development Goals

MoH: Uganda's Ministry of Health

OD: Open Defecation

SNV: Netherlands Development Organization

WASH: Water, Sanitation, and Hygiene

WHO: World Health Organization

UGX Ugandan Shilling (Currency)

UN: United Nations

Introduction

The WHO stated in 2014 that over 2.5 billion people worldwide do not have access to basic sanitation. This means that over 1/3rd of the world's population lacks safe means of disposal of excreta and waste water. Despite continued efforts to promote sanitation since the 20th century, 40% of the world's population is still without basic sanitation (Kwiringira, 2014). This percentage of course does not tell the whole story, as many factors have led to this abysmal global percentage. Sanitation coverage is often much lower in rural areas than in urban areas. This is often a result of poor supply chains, limited education on the alternatives to open defecation, as well as education on the benefits on the installation of basic sanitation facilities.

These rural-urban disparities can be seen very prominently in the African continent. In Africa, around 53% of urban dwellers have access to basic sanitation facilities, but only 29% of rural residents have access to basic sanitation. (UNICF 2008). In many cases, improving sanitation can be as simple as installing a well-designed ventilated improved pit latrine (VIP) or composting latrine. However, in other cases, improving sanitation can be more challenging, particularly in rapidly growing urban slums. Moreover, while building improved sanitation facilities is a crucial health intervention, the full health benefits will not be realized without proper use and maintenance of the facilities and good personal and domestic hygiene agendas (Carr and Strauss, 2001).

One of the biggest reasons to increase sanitation access is the reduction of the spread of disease vectors. Sanitation facilities interrupt the transmission of fecal-oral disease vectors at their most prolific contamination source (exposed human waste), and these facilities prevent human fecal contamination of water and soil. This waste can also make its way into agricultural areas and contaminate the crops, leading to further the spread of fecal particulate matter that can cause severe health effects, such as diarrhea in children. Diseases such as childhood diarrhea are closely associated with insufficient water supply, inadequate sanitation, contaminated water and crops, and poor hygiene practices. Diarrhea is estimated to cause 1.5 million child deaths per year, mostly among children under five living in developing countries, so increasing the levels of improved sanitation can be vital in lessening the disease burden of the developing world (Letema, 2014).

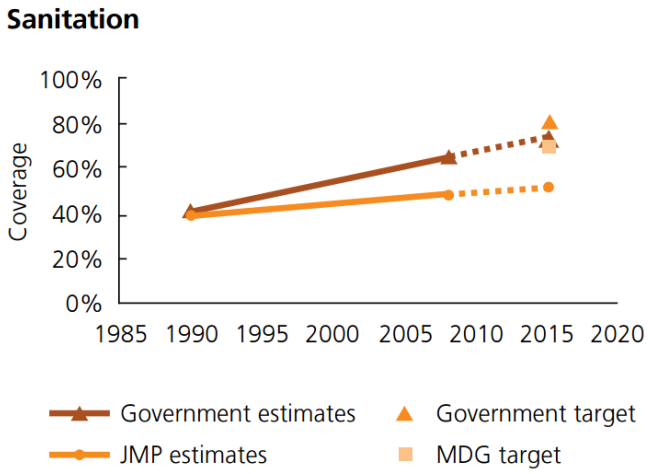
Poor waste disposal practices are responsible for a significant proportion of the world's infectious disease burden. Diseases due to poor water supply, sanitation, and personal and domestic hygiene causes "4.0% of all deaths and 5.7% of all disability or ill health in the world" (WHO 2014). This burden is not distributed equally however, as waterborne illnesses predominantly affect the poor and the young. However, when basic water, sanitation, and hygiene interventions are applied, waterborne illnesses can be effectively reduced, and low

cost interventions such as composting latrines can be used to reduce the transmission of many diseases. It has also been shown that every US$1 invested in improved sanitation translates into an average return of US$9 (WHO 2014) due to a variety of societal factors that arise from increased sanitation promotion. Among these factors are; reduced health care costs for individuals and society, greater productivity and involvement in the workplace through better access to safe sanitation facilities, and the opportunity for growth of new industries. The proliferation of sanitation programs can also cause infrastructure and economic development in the realm of the disposal of human waste such. Developments such as the construction of urban sewage systems, as well as the opportunities that exist in expanding the delivery of sanitation services and materials can lead to many new economic developments in rural and urban centers alike.

Aims of Research and Research Objectives

What this research aims to explore, is if the participation of the private sector can be improved to increase the levels of improved sanitation in the rural areas of Arua, Uganda. The discussion of whether if the private sector is more capable or efficient in the provision of services has been constantly debated since the inception of neoliberal development thought, and this discussion only intensified during the days of structural adjustment in the late 20th century. Yet, research into how the private sector has performed in rural northwest Uganda has been scarce, leading to questions of if the private sector can succeed in providing sanitation services in the district of Arua. Discovering if whether the private sector can be a useful tool in the development of improved sanitation facilities in the region, evaluating current performance and results of the private sector, as well as uncovering issues that hinder the performance of the private sector can all be very valuable tools to find solutions for sanitation in a country where weak state participation has led to few sustainable results in the past 15 years. This poor state of sanitation coverage can be seen in *Figure One.*

Figure One: Rural sanitation levels of Uganda since 1985 (World Bank, WSP and AMCOW, 2015, 8).



Sanitation levels in Uganda are quite low when compared to other Sub-Saharan countries. Currently, access to improved sanitation sits at around 34%, while neighboring countries such as Rwanda and Ethiopia sit at around 64% and 56% respectively (WHO/JMP, 2015). Though

the government wants to dramatically increase the levels of health in the country, it is apparent from observing the low increases in sanitation coverage and access over the past 15 years that the government alone cannot tackle the issue head on. This is where the inclusion of the private sector and private interests come into play.

These interests, separate from the state, have the ability to offer new solutions to tackle service provision in rural areas such as Arua. Through the different incentives that the private sector inherently has, such as profit and expansion of both service area and customer base, new solutions and products can more easily make their way to underserved areas of Uganda. If this partnership of both private and public interests are properly managed, fostered, and overseen by both international and mutual observers from both the state and the private sector, the state of Uganda's sanitation coverage has the potential to be improved greatly in the 21st century.

Practical aim:

The aim of this research is to find out the current state of the sanitation supply chain in the West Nile region, and to discover what barriers and issues cause a lack of latrines and sanitation facilities in this region. This research is necessary in order to discover how to strengthen the supply chain in the region and correct the issues that bring about the poor level of sanitation coverage in the region. This research will bring different issues to light such as service provision availability, the willingness to pay and invest from consumers and providers alike, geographical barriers, as well as how willing the private sector is to expand into the rural areas. Through analysis of these issues and barriers, a more complete view of the current state of the supply chain, as well as potential solutions to these issues, will become clear.

Academic aim:

This research aims to increase knowledge about sanitation supply chains in Uganda, and if the solutions proposed in this study can be applied to other East-African locations and states. This study also aims to provide an example of the benefits and drawbacks of increasing private sector influence in Uganda. The increasing presence and role of the private sector in the sanitation sector is occurring in many developing countries around the world, and this study will attempt to highlight where the private sector succeeds in providing improved sanitation facilities, and where it fails. This data can then be used in correlation with other studies to form a more factual view of the private sector's involvement in the sanitation supply chain, and where it can best be instituted.

Theoretical framework

Sanitation Policy and Practices in Uganda

The current state of the sanitation sector in Uganda is one that was birthed from various factors that span decades of policy choice and implementation. The origins of the private sector influence in Uganda can be plainly seen if one examines the neoliberal reforms that swept the developing world in the 1980-90s. These reforms, especially in Uganda, were based on "an old neoclassical economic argument that society functions better under a market logic than any other logic, especially a state-command one" (Purcell, 2008). Moves by the GoU in the late 1990s, such as the modernization of the state agency responsible for sanitation (NWSC), created improved levels of sanitation in the most urban areas of the country, yet also created many disparities in the rural areas that are still present and prevalent today.

These policy moves made by the GoU were created in hopes that private individuals and organizations would see economic incentives to invest and participate in the sanitation sector where the state agencies are not present. Though, as is the case in many developing countries across the world, pushes to include the private sector yielded results that were less than expected in reaching the millennium development goals, yet the private sector's role in water and sanitation is gradually increasing, although it is currently concentrated in the provision of water supply. (Murray, 2011).

One of the questions that one would be pressed to ask in light of Uganda's sanitation history is "*what has caused this low performance from the private sector in the development of improved sanitation facilities in the rural areas of Uganda?*"

This research aims to discover what blockages and issues the private sector has encountered in these rural areas, and what solutions could best be implemented to insure that the private sector can effectively increase access to improved sanitation through the sanitation supply chain.

Defining Improved Sanitation

Defining at what level a sanitation facility is "improved" is vital to formulating solutions to increase the spread of safe and sustainable sanitation practices and policies. The term was set in 2002 by a collation of international agencies including the UN, UNICEF, and JMP, as a way to monitor progress towards the completion of MDG number 7c, which is "to halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation." This goal was to be measured through the "Proportion of urban population with access to improved sanitation" (UN, 2000).

This collation defined "improved sanitation" simply as:

A facility that hygienically separates human excreta from human contact.

This broad definition leaves a bit of leeway for the differences that are inherent in the way different cultures construct sanitation facilities, as well as what materials and methods these various cultures can utilize and afford. In light of this, the JMP has stated that these types of toilets are suitable to be labelled as an “improved sanitation facility” (WHO and UNICEF, 2012).

- **Flush toilet**
- **Connection to a piped sewer system**
- **Connection to a septic system**
- **Flush / pour-flush to a pit latrine**
- **Pit latrine with slab**
- **Ventilated improved pit latrine (abbreviated as VIP latrine)**
- **Composting toilet**

Though in the context of Arua district, a pit latrine with a slab is the primary type of improved satiation facility available, with VIP latrines being a rarity, primarily dotting some village centers and schools. These pit latrines with slabs are what most of the populous of Arua utilizes, and though these latrines can provide decent levels of improved sanitation, some issues are present in this type of latrine. These latrines are most often sourced from local materials, which can cause sustainability issues due to latrine collapse as described in sub-question one. As a result, this study will focus solely on these pit latrines, both “traditionally” constructed, as well as ones constructed with more durable materials.

The Private Public Partnership of the developing world

The world of development has been shifting to include more private sector influence in the past two decades. Neoliberalism became a prominent force in development policy instituted by both State and international forces, which included many policies relegated to the selling off of state assets to private interests, or leaving certain aspects of development to the private sector. These interventions from private influences have produced mixed results, and as is the case in all development strategies, the inclusion of the private sector is not a one stop shop to bring about development.

In Uganda the state has stated time and time again the desire to bring about high levels of increased sanitation in the country, yet the government of Uganda has created no subsidies for the creation of improved sanitation facilities. (EU Water Initiative Africa, 2011). This lack of governmental investment is compacted by differing bylaws in each district of the country, which create a disorganized state sanitation sector. The Uganda state has placed the rural development of improved sanitation facilities largely in the hands of private interests and organizations. This is, in part, a result of governmental inefficiencies in the funding of sanitation development. One such example of these inefficiencies is the creation of a committed budget for sanitation, yet no funds are in place, and deliberations as to which ministry should manage the budget line are ongoing, if not stagnating. (World Bank, WSP and AMCOW, 2015). This

disorder and political gridlock in issues related to sanitation has caused the MoH to turn to actors outside of the state sphere.

NGOs, both local and international, work alongside the private sector to introduce concepts of improved sanitation, as well as supply both the knowledge and physical supplies necessary in the construction of improved sanitation facilities. State funding levels for the promotion of sanitation in the rural areas are extremely low, and the methods of promotion for sanitation solutions are scattered among different projects, many of which are undertaken by NGOs rather than through a sector wide approach (World Bank, WSP and AMCOW, 2015). One of the methods that has arisen from these neoliberal reforms is the prevalence of public private partnerships in the WASH sector of many developing countries. These push for PPP began to be instituted heavily in the 1990's and have since seen success in many developing countries around the world. In fact, from 1990 to 2009 nearly 1,400 PPP deals were signed in the European Union, representing a capital value of approximately €260 billion" (EIB, 2014). This massive amount of capital has been the result of these partnerships in various sectors of services in many different countries, yet there are still many tweaks to be made in the way that organizations and state services set up these partnerships with private interests. One of the older conceptions of PPP in the context of the WASH sector is that it works mostly in urban areas where there is more willingness to pay, yet areas such as Arua have not often been measured to see to what extent there is a willingness to pay for latrine construction and sanitation service. If this willingness to pay is found, explorations into PPP become a lot more feasible.

SNV often pushes for public private partnership contracts in many of the counties that it operates in. In Rwanda for example, SNV utilizes PPP for the delivery of water to over a million people. SNV states that PPP contracts such as this that bring together a private sanitation company and impose a tariff on the users of the service only has success in areas with households that are willing to pay for the service. This sort or contract has the potential to be instituted in Arua if there is a willing ness to pay, and this paper will explore one such aspect of this willingness to pay, offering insight if similar programs should be explored in Arua. Michiel Verweij from the Spanish NGO ONGAWA summed up the roles of NGOs such as SNV in facilitating PPP contracts and other inter-actor projects as "I believe NGOs have an added value as neutral players to broker information on technology and management between the private and public sectors. Especially in the initial stages, NGOs can assist in social mobilization to organize and create demand for water, sanitation and hygiene therefore maximizing impact of the PPP" (SNV, 2013). This method of assistance that NGOs such as SNV utilize to create WASH development projects can be a powerful force in bringing together the various actors that make up this PPP, and this approach may work well in area of Arua if managed properly.

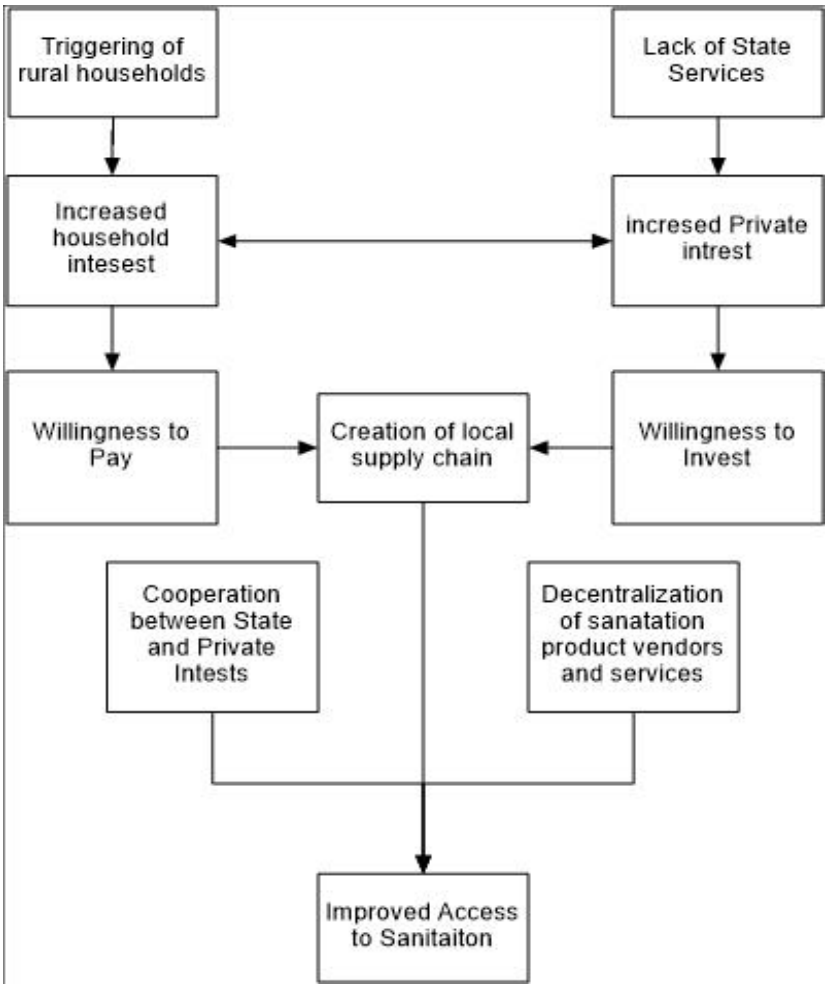
This method of private interest inclusion has the potential to benefit Uganda greatly, and similar sanitation polices have been successful in developing countries around the world. In some countries, such as Argentina, there has been great success from the state selling off the publicly held services to the private sector, while also utilizing the private sector to supply sanitation products and services to the rural areas of the country. This policy by the Government of Argentina resulted in an increase in access to water for 2 million people, and increasing access

to sanitation for 1 million people since the inception of the program in 1992 to 2005 (Botton, Braïlowsky, and Matthieussent ,2005). This success arose mostly from strong state oversight on these private companies, as well as subsidies for the poorest of the country so that they too could access both improved water and sanitation, even in the very rural areas of the country. The private sector must utilize a supply chain to bring their products and services to the rural areas, and discovering the way that the chain is formed and utilized is pivotal in replicating the success of policies in countries such as Argentina.

Understanding the different actors that are involved in the creation of the supply chain, how they interact, and what issues they face is important in creating a reality where private interests can flourish and bring about improved sanitation access in areas where governmental support isn't a viable option. If Uganda follows a similar path, improved sanitation coverage may be closer than imagined, and both private interests as well the end consumer can benefit.

Context of the Supply Chan in Arua district

Figure Two: Conceptual Framework of the Supply Chain



In order to gain an understanding of how the sanitation supply chain could be improved in the rural region of Arua, an understanding of how and why these local supply chains develop is crucial. Above is a conceptual model that explains how these chains originate in Arua, and how the different actors, attitudes, and actions all link together to form the sanitation supply chain. This framework in turn serves as a guide for how the WASH sector operates in the region, and how the links come together to provide improved sanitation.

The utilization of the supply chain concept in this research was chose as it can easily highlight the factors in what causes the breakdown of the provision of sanitation facilities. This concept of the supply chain has roots in the holistic analytical approach of Systems Thinking. As is the case of systems thinking, breaking down the constituent parts of the supply chain can reveal the

areas in which the chain is the strongest, but most importantly, the weakest. This way of thought is useful in seeing how small events or opportunities can create a massive set off consequences in the context of the sanitation sector. These by-products of small events can be seen in contexts as local as a village becoming sick from returning to OD after the collapse of the only latrine, all the way up to how the withdrawal of the GoU from the rural sanitation sector spurred the development of this supply chain in the first place. This approach offers much insight into not only how the chain developed, but also how interventions in any level of the chain create ripples throughout the whole, which in turn can inform any actor in proper and appropriate decision making in regards to sanitation sector development.

This approach is useful in areas such as rural Arua as a result of the multitude of actors and factors that must be present in order to provide sanitation to such a geographically spread-out region. There is extremely limited state presence in these areas and the materials, motivations, and actor interaction all are acquired, learned, and handled in very different ways then from urban areas, where utilizing or constructing a sanitation facility is often much less complex. Discovering how the different links in the chain originate in these rural settings, how the links depend on each other, and most importantly how they influence each other is very useful in the development of future rural sanitation policies and practices.

One such example of how the links in the chain influence each other is seen in the chart above. The influence of interest is shared mutually between the households and private interests. This is a result of households demanding sanitation services from other entities in situations where there is little state presence, while private interests notice the lack of state presence and provide services as through economic incentives that present an opportunity to provide a needed service.

Steps in the Creation of the Supply Chain

The first step in the creation of the supply chain is, naturally, the creation of demand. Most households in the rural areas of Uganda have limited latrines, and many households that have not been “triggered” often have no sanitation facilities. These communities that have no sanitation facilities usually resort to OD (open defecation), or utilize very basic and unsanitary methods of faeces disposal such as hand digging a hole and covering it once finished.

SNV as well as other NGOs across the country that deal with sanitation issues utilize different methods of triggering households. SNV uses a tactic that is purposed to induce disgust and a bit of shame for the village. This tactic is accomplished by the SNV field staff talking to the village and discovering where OD takes place, then collecting the human faeces and taking it to where the village has gathered. The staff then places a bag of food down on the ground next to the faeces and shows the community how files jump back and forth from the food to the faces, highlighting the ease of food contamination risk from OD practices.

After the village has seen this demonstration, a pledge of sorts is made and the village commits to a plan to construct latrines in the community within a certain timeframe. This is the first step in the creation of this supply chain as demonstrated in the flowchart above. The interest in the

local community is piqued, and service providers such as masons and pit diggers are requested and sought after from the surrounding area. This sort of demand works both ways, with households in the villages garnering interest which in turn leads to individuals gaining interest in new work opportunities and stepping up to fill the service gaps that exist in these rural areas.

In the villages that have already been triggered and have latrines, SNV highlights that these latrines are made of substandard materials which often fail from rain, wind, poor soil textures, as well as sub-par construction techniques. Though these rural villages currently utilize locally sourced materials to construct their latrines, discovering if there is a willingness to pay for better services and products can assist greatly in formulating solutions to increase the strength of the supply chain, and in turn private sector participation.

Yet, once these interests are piqued, there can be a multitude of difficulties that arise in both the access to these products and services, as well as how the private interests involved in providing these services and products can reach new consumers. Blocks to the development of a widespread private sanitation sector is caused by many factors. The predominate factors observed were; *the distance to quality sanitation products*, such as concrete and hardware stores; and *knowledgeable service providers*, such as masons and pit emptiers who can construct quality latrines. These issues cause many households to have latrines that exist as a rudimentary device that does little to stop the spread of disease vectors, or cause the complete lack of a sanitation facility.

The lack of access to these sanitation products and services can also halt the development of latrines, or the replacement of latrines that have failed through collapse or other factors. Understanding how to decentralize these products and services in areas with limited to no state participation is crucial in forming a working supply chain that can reach the less urban areas of the district, where sanitation rates are most often the lowest. Through discovering solutions in this issue, improved access to sanitation can achieved in many rural areas of the district.

Finding a workable way for private and state interests to cooperate and support the development of sanitation is also a very important part of improving access to sanitation in the rural regions of the country. The GoU has already begun to implement policies that allow the private sector to work alongside the state in the provision and dissemination of sanitation products and attitudes, yet these policies of cooperation have not yet yielded the results that neither the GoU nor international health organizations have set to accomplish by 2015.

Neoliberal Thoughts and Capacity Building

The findings of this research aim to present methods and solutions to these questions which have the potential to bring about increased sanitation in the rural areas of the district Arua. While many of these factors have been written about since the inception of the notion of the sanitation supply chain, there is no comprehensive study that look into the factors that cause the lack of sanitation rural north-western Uganda. Papers have been published that have looked at sanitation as a whole in Uganda such as *The politics of utility reform: a case study of the*

Ugandan water sector by Dorcas Mbuvi & Klaas Schwartz in 2013, which gives a good view of the failings of large scale utility reform to the private sector, yet papers that research sanitation in rural region specific contexts of Uganda are sparse. One of the main influences of this paper is the rising prevalence of post-development thought, which stresses the formulation of tailor-made solutions specific to the social, economic, and geographical constraints of populations and regions.

The 20th century "catch all" methods of development policies and practices have led to the disenfranchisement of both the "developed" and the "developers" alike. The methods in the past often operated on a national level while leaving the state to sort out the minute details. This obviously can cause issues, particularly in Sub-Saharan countries, where the population of a state is often fractured along lines of language, culture, religion, resource consumption, as well as attitudes toward intervention from the state. These various factors create a necessity for individually formulated development programs that have a higher potential to be sustainable and a lower potential to be rejected on the basis of the factors listed above.

It is pivotal to discover how to improve these different factors of the supply chain if the state of sanitation in the rural area of Arua in north-western Uganda. Through researching the state of the sanitation supply chain in this region, and uncovering the limitations and potential solutions to overcome the obstacles blocking the further development of supply chain, a more informed debate can be started and news solutions can be formulated by policymakers to support the development of sanitation in the rural regions of Uganda.

In light of the above, the main research question of this paper is such:

How can the local private sector enhance the sanitation supply chains of rural Arua, Uganda so that increased access to improved sanitation services, facilities, and products could be achieved?

Regional and thematic framework

Health and Sanitation, and the impacts of Sanitation Service

One of the main approaches to the topic on sanitation is to measure the impact on health that improved sanitation systems bring about in developing countries. As discussed in the UN-Water and WHO report *Global Analysis and Assessment of Sanitation and Drinking-Water,* the benefits of research on the supply chains of sanitation delivery is immense. The impact of proper sanitation service delivery can have immense health impacts on the local setting of Arua, as well as other sub-Saharan areas, and discovering where these supply

chains fail or could be improved can bring about increased sanitation development, thus increasing local health.

The above mentioned UN report states that as a result of past research and intervention by both international and local actors, millions of children have been saved from premature death and illness related to malnutrition and preventable water-borne diseases such as diarrhea (WHO 2014, pg3). In addition, the UN has recorded better maternal health and care for newborns, and adults in general living longer and healthier lives as a result of proper sanitation facilities. The latest WHO *WASH Burden of Disease Report* has also confirmed the importance of enabling universal access to basic water and sanitation services. The WHO found that raising service levels of safe and continuous water supply and access to improved sanitation facilities could significantly reduce diarrheal diseases up to 70% (WHO, 2014, 36). Much research has been done on the effects of increased sanitation, but the research that this paper undertakes is a study into the integral links that bring about sanitation. This research is necessary to understand the full picture of the provision and availability of sanitation systems in the developed word.

Economic and Geographical aspects of sanitation

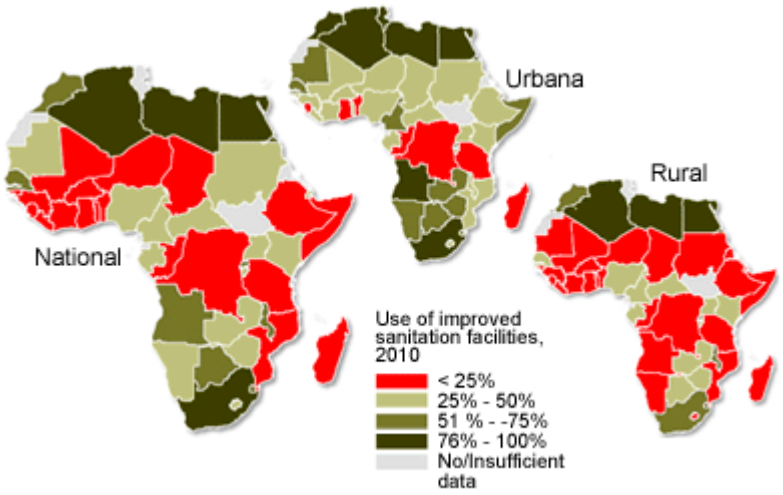
One very important aspect that is necessary to account for in sanitation distribution is economics. There are many characteristics that range from district to district that influence both the economic feasibility of sanitation, as well as the availability of sanitation supplies. Of these characteristics, the WHO found that there is a strong correlation between where people live and their level of access to improved sanitation facilities in Uganda. Wealth also has a strong correlation to the access to improved water supply and sanitation and the ability to practice improved hygiene behaviors. As the WHO states has found, “there is a strong relationship between wealth, as measured by household assets, and use of improved water sources and sanitation” (WHO, 2014, 31).

This trend is of course not limited to just Uganda, and many countries around the world have experienced an ever increasing disparity of sanitation access between the different economic classes of each respective state, and improved services have continued to be disproportionately more accessible to more advantaged populations, particularly urban dwellers. This sanitation access inequality based on economic lines has favored the urban population for the past two decades.

In 2012, the majority of people without improved sanitation, roughly 7 out of 10 people, lived in rural areas (Okot-Okumu, 2014, 58). Improved sanitation coverage in the rural areas increased from 11% in 1990 to 17% in 2012. When compared to the rate of urban sanitation increase from 28% in 1990 to 29% in 2012, it is easy to observe the differences Uganda

experiences in sanitation provision (JMP, 2015) Though the urban expansion of sanitation services increased at a slower rate that the rural areas, the total coverage in the cities dwarfs the rural areas. These relative increases are a result of many factors, though many of them are economical in nature as wealth has grown in many rural areas across the developed world and a multitude of actors are influencing the construction and funding of sanitation systems. Though these increases are promising, there is still much work to be done to meet the MDGs, albeit behind schedule. To get a sense of the distribution of these disparities in Africa, a map illustrating the gaps between rural and urban sanitation access can be seen below in *Figure Three*.

Figure Three: Levels of Sanitation in Sub-Sahara (AMCOW, WHO/UNICEF JMP, 2012, 6)



To many individuals in these developing countries, spending the money on a latrine is just not a feasible option for them, thus leading to increased open defecation, particularly in the rural areas. These latrines can sometimes cost more than a family may make in a month and the incentives are not very high for many individuals and communities. SNV found in their consumer report in 2014 that prices for complete quality latrines can range from “USD 200 to USD 1,000, with the differences in prices partly due to the quality of the latrine” (e.g. lined pit, thickness of slab), partly due to geography (e.g. difference in availability and prices of materials), and also due to the particularities of the mason constructing the latrine (his experience and skills). These high prices and spatial disparities are why governmental and international assistance is often required to achieve the sanitation goals set out by the MDGs. Though as *Figure Four* shows, even with the assistance of both national and transnational actors, Africa and Uganda are unlikely to meet the MDG for sanitation this year.

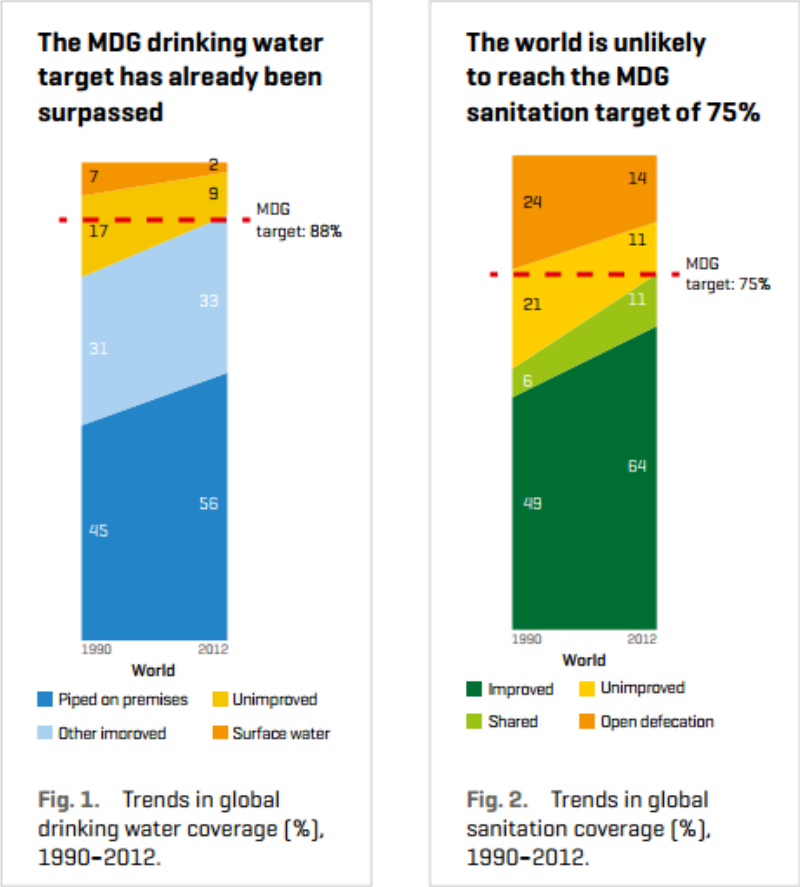
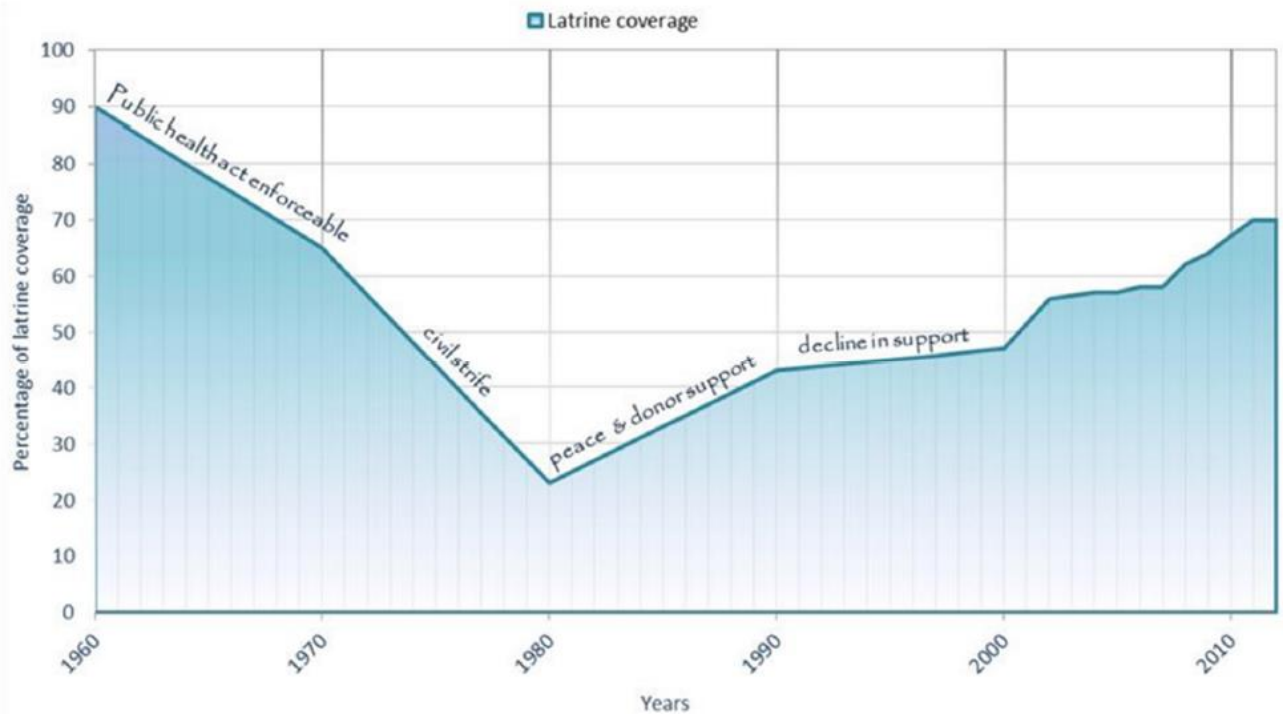


Figure Four: MDGs of Water and Sanitation (WHO, 2014, 8)

Uganda Overview

Uganda has a population of about 38.04 million people, approximately 87% of which reside in rural areas (World Bank 2014). The Joint Monitoring Program for the World Health Organization and United Nations Children's Fund have estimated that sanitation coverage in rural areas is only about 34% of households in 2015, yet improved sanitation in these areas only stands at 17% (JMP, 2015). This means that anywhere between 8.25 million and 25 million rural Ugandans lack access to improved sanitation facilities. This gap in coverage represents a major opportunity for suppliers of sanitation products and services to assist households in adopting or improving their existing sanitation facilities (PATH 2012). The local sanitation supply chains of different regions can assist in the closing of this gap, and the various regional actors that play a part in making up this supply chain have the ability to not only bring about increased sanitation in their local districts, but also to benefit from new business and employment opportunities.

Figure Five: Latrine Coverage in Uganda since 1960 in relation to policy (SNV, 2014, 11)



Uganda has gone through a distinguishing pattern of sanitation coverage in rural areas over the past 55 years. This pattern is almost cyclical yet tapers off towards present day. *Figure Five* above shows rural sanitation coverage starting from a very high base after independence, based on enforcement policies implemented by local governments, to a total collapse of coverage at a low of almost 30 % towards the mid-1980s due to civil strife that was consuming the country. Keep in mind this graph details any type of latrine availability, and the rates of improved latrines are even lower. There has been a slow recovery since the civil strife, and the growth has stagnated at times, but the sanitation sector in the country continues to grow slowly at sporadic rates over the past 10 years. (SNV 2014). Due to the high population increase (the population increase in rural areas is estimated at one million per year) and declining effectiveness in sanitation promotion, the sanitation system in Uganda has stagnated over the past few years resulting in current levels still being lower than pre-independence values. *Figure Six* below gives an overview of the different levels of sanitation coverage in the country, also highlighting the very low figures of sanitation in Arua.

Figure Six: Sanitation Graph of Uganda's Districts (SNV, 2014, 5)

	region	District	Rural population	HH san coverage SPR 2014	SSH4A baseline	SSH4A people without sanitation	SSH4A District targets	Result contribution per district
1	RWR	Bundibugyo	234,300	71.0%	71.0%	67,947	40,000	5%
2		Kasese	638,310	85.4%	72.0%	178,727	80,000	10%
3		Kyenjojo	323,400	84.5%	73.0%	87,318	30,000	4%
4		Mubende	612,500	82.1%	73.0%	165,375	60,000	8%
5		Kibaale	677,700	75.6%	76.0%	162,648	90,000	11%
6		Kabarole	322,100	56.0%	71.0%	93,409	80,000	10%
7		Kyegegwa	156,200	77.5%	65.0%	54,670	20,000	3%
8		Kamwenge	329,100	79.0%	76.0%	78,984	20,000	3%
9	WNR	Arua	736,300	63.0%	37.0%	463,869	120,000	15%
10		Yumbe	532,600	50.0%	36.0%	340,864	120,000	15%
11		Koboko	190,900	73.0%	48.0%	99,268	20,000	3%
12		Maracha	172,000	70.0%	50.0%	86,000	20,000	3%
13		Nebbi	305,000	77.6%	47.0%	161,650	30,000	4%
14		Zombo	201,000	71.0%	54.0%	92,460	30,000	4%
15		Moyo	401,900	88.0%	60.0%	160,760	30,000	4%
	Total		5,833,310			2,293,949	790,000	100%
	Country		29,723,687	74.6%	60%			

Current state of the Sanitation Supply chain in Arua district

The supply chain for slabs in Arua are unique on account of the concrete slab suppliers operating there. This district is an outlier in this regard as many of the rural districts in the country don't have such a product available for consumption. SNV details one of these concrete slab producers named "WE Concrete." WE Concrete is an individually owned company that was established in 2005 in the regional capital of Arua. This city is often seen as the gateway of West Nile Region, as it borders both South Sudan and the DRC. This location allows it a prime spot in the supply chain, though this location is very centralized, leading to issues in dissemantinof the product to the rural areas. This company has little competition in the region, with only 3 other slab producers operating in the city, yet more are starting to spring up. All of these concrete producers sell multiple concrete products, one of which is the latrine slab. Though these slabs

are expensive for rural households, these concrete producers offer a few options that range in price from as little as 12 euro up to 25 euro. These slabs often come in two different sizes that can be ordered depending on the client's wishes for the latrine project, and slabs can be made on site at the client's latrine as well, which costs roughly 15 euro. Though this company is very important, the other materials for constructing an improved pit latrine come from elsewhere in the country.

High quality doors and walls (such as sheet metal) increase the lifespan and privacy of latrines, yet distribution issues to the rural areas cause many to utilize sheets and grass roofs for the construction of their latrines which can easily be destroyed by rain and high winds. These doors and roofs, as well as the various other hardware such as mountings for these items, often come from hardware shops in more urban areas of the country. Many of the villages around Arua district are disconnected from these urban centers on account of the large distances required to travel to these urban centers, as well as the common impassibility of roads during the rainy season in Arua district.

Masons are responsible for constructing the superstructure around the latrines, as well as the slab of the latrine in many cases. These masons are often spread throughout the parish and sub-county, which makes them difficult for local households in rural villages, who don't possess the knowledge of how to self-construct a latrine, to construct an improved sanitation facility.

As a result there is no "one-stop-shop" for latrine construction in the region. Even the slabs that WE concrete supplies, SNV observed as "quite weak" and also did not have a place for "a ventilated pipe or not sloping towards the pit" (SNV 2014, pg33). They discovered that the owner did not see much potential for large-scale marketing of the latrine slab. This slab, though cast and most likely more "standardized" that a pour from an amateur citizen, does not hold a lot of potential to be utilized in sanitation system development in the district. This research aims to discover ways that all of these different aspects of latrine construction can be reconciled in order to create a more efficient and wide reaching supply chain. This research must be conducted in order to discover the true extent of these local supply chains, and the blockages and linkages between the various segments of the chain.

Methodology

Operationalization of Variables

In order to fully quantify the scope of this research, a description and operationalization of variables in context of the questions being investigated is essential. This section describes and defines each relevant variable that is necessary for a full undemanding of the research

questions, and how the data collected will be measured and applied to answer the main and secondary research questions.

Increased Access is defined as more readily available opportunities to construct a latrine in a rural setting. This includes increased availability of materials and construction services for rural villages.

Sanitation Supply Chain is defined as the system of organizations, individuals, service providers, manufactures, importers, and distributers responsible in delivering the resources and information necessary for the construction of an improved sanitation facility (Nagurney, 2006). The aspect that this research investigates is how this supply chain can better supply the customer with the opportunity and knowledge to construct an improved sanitation facility. The customer in this context rural villages in Arua district.

Improved Sanitation Facility is defined as a facility that hygienically separates human excreta from human contact (JMP, 2008). This can be a latrine such as a VIP, pour flush, or septic flush toilet, a pit latrine with a traditional slab, or a composting toilet. These types of sanitation facilities are utilized instead of open-defecation, therefore an improved facility is one where the faeces is contained away from human interaction and environment.

Local Private Sector is defined in the context of this research as private individuals and entities that in the business of providing sanitation products and services in return for compensation (payment, trade, favours, etc.)

Sanitation Services is defined as businesses and individuals that assist in with the construction and maintenance of a latrine. This includes; masons, pit diggers, concrete slab producers, septic tank emptiers, and aggregate producers.

Sanitation Products are products sold in the country that facilitate the improvement of an improved sanitation facility, such as products that stop flies from entering the pic, or items that prolong the lifespan of a latrine such as metal roofing. These types of products are valuable in tracing where the supply chain is weak, and showcase what types of improvements can be made in the supply chain to allow improved access to sanitation services, construction knowledge, and materials.

The main research question is to be answered by five supporting sub-questions that highlight and present the various realties and limitations that are predicted to be present in the sanitation supply chain. These sub-questions are listed below with a brief summary of the context, relevance to the research question, as well as the predicted impact the data from each sub-question will have on answering the main research question.

1: What sanitation services and products are currently available, and what issues do the service providers face in delivering their products?

This question is useful in finding the current state of the sanitation supply chain in Arua district. The measure of the available options customers, namely rural households, have at their disposal can shed a light on what sorts of solutions would be helpful in bringing about increased access to sanitation by addressing the gaps that exist in product and service delivery. This will be measured through observation of what local service providers have to offer to the residents, as well as through households' awareness of how and where to find sanitation products and services, as gathered through the household questionnaire.

2: To what capacity do local, regional, and national actors interact to provide sanitation products and services?

Discovering the connections between the various actors that all have a part in the supply chain is an important to discovering where issues in the supply chain are present, as well as how these issues affect the other members of the supply chain. Following the actors in the supply chain is also necessary to form a solid picture of the web of actors that all cooperative to form the supply chain, which will allow a more comprehensive view of the origins of issues faced by each actor at the various level, and whether these issues are caused by members further up the chain or external actors.

3: What factors influence residents to construct improved sanitation facilities?

Discovering people attitudes towards the construction of latrines can be very important in discovering why individuals have, or don't have, improved sanitation facilities. This research will look into factors such as; education about the importance of latrines for village health, LCB influence, governmental interventions, and various other factors that influence residents to construct improved sanitation facilities. Understating these factors can provide insights on potential solutions such as behavior change, or increased LCB activity, which could bring about improved sanitation facility coverage.

4: To what extent is there a willingness to pay for these sanitation services and products?

The willingness to pay for the materials and construction of a latrine is a very important in discovering if it is a present cause in the low latrine coverage in the district. The construction of a latrine can often be a large investment for individuals that live in the rural areas of Uganda, and discovering if the willingness to pay is present then other factors, such as the lack of materials or service providers, that can be used as reasoning to corroborate why there is low latrine coverage in the area. This will be measured through the household questionnaires that include questions on how much they would hypothetically pay for services and materials, as well as what they paid for services and products if the respondent has experience with such.

5: What are the levels of consumer satisfaction with current sanitation services and products, and the availability of the products and services?

Finding out how satisfied customers are with the services and products that they have received, as well as how available these services and products are contributes to both the initial construction of an improved sanitation facility as well as additional facilities in the future. Discovering why they are dissatisfied is particularly important in formulating solutions to correct this dissatisfaction that could block or limit the expansion of latrine coverage in the rural areas of Arua district. This will be measured through a product satisfaction section that is present in the household questionnaire that detail the levels of satisfaction with various working of the supply chain.

Regional organization:

The local governmental structure in Uganda is divided into four different levels. From top to bottom these are National, Region, District, Sub-County, Parish, Village, and Household. Each of these levels have different tasks and organization when it come to the provision of sanitation facilities, as well as different roles in the supply chain. This study focuses on the lower 5 levels to determine the current state of the supply chain in Arua District.

Sampling Method

These locations were chosen through purposive sampling utilizing the SNV baseline study, which contained a detailed description of the rates of latrine coverage across Arua district. This data base was utilized as the local and national government does not have such records that were up to date, or existent in the first place. The Government of Uganda (GoU) has turned to the private sector to increase latrine coverage in the country through the use of development organizations such as SNV, as well as relying on these organizations and actors for data collection around the issue of latrine coverage (GoU 2010). Therefor the SNV database for the baseline study was the main tool used to target villages and sub counties for sampling.

These questionnaires were based on part from the “Sanitation Marketing for Managers” by USAID. The SNV baseline study also contained useful information to construct the questionnaires, while many questions included were born from the cultural context of the region observed in the pretesting. Interviews and questionnaires with different actors within the population that are involved in the supply chain was critical to understand why the supply chain is in its current state.

Method of Interviewing

This study utilized 5 different questionnaires to collect data from the various areas around the district of Arua. These questionnaires were collected in 7 different sub-counties in two total districts, of which 3 had LCB intervention and 4 did not. The sample was selected in this way to create a pathway for comparison between areas where intervention for sanitation had taken place and where it has not, so that a picture of where the supply chain is weakest and strongest could be observed. This method of sampling was very useful to determine to what extent LCB involvement created demand for the local private sector in areas around Arua district.

Before the questionnaires were collected from around Arua district, pretesting was required to finalize the questionnaires for cultural sensitivity and local context. This pretest was also useful in creating a proper flow to the questions, as well as place alike questions that correspond to each other in the same section. This was done to gather a deeper and fuller understanding about various aspects of the supply chain, as juxtaposed questions could hinder response quality and depth through topic shifting and loss of concentration on part of translator and respondent alike.

The translators noted the response of the respondents in English on paper forms as they conversed with the households and service providers. These translators were instructed in the intention of the questions, as well as the various aims of the research in order to minimize confusion and translation issues. As the translators worked in a team along with myself as an observer, any questions in translation could be directed at the other translator, and inquiries on the questionnaire content such as the aim of certain question in a unique context could be directed at the researcher.

To carry out the questionnaires for the households and service providers, a team of two translators conducted in person face to face interviews in various villages in Arua District. The section below details the method for which the questionnaires were collected, as the makeup of the questions and aim each section of the four different questionnaires.

Household Sampling Method:

Once at the village level, snowball sampling methods were utilized to target service providers as well as households so that questionnaires could be completed. Through this sampling method, insight into the locations of the services available to the local population was gained and analysed for geographical disparities among the various sub-counties of the district.

After arriving in the villages the research team would use this snowball sampling to find which households in the area had latrines, and which ones did not. After these prospective households were identified, the appropriate questionnaires were collected. Since this sampling method is based on purposive selection, results cannot be generalized to the entire regional population.

Though, as the districts were chosen to be geographically distant from one another, the issues that are present in the supply chain can be seen in an overview fashion.

The household questionnaire was compiled into one form that included both households with and without a latrine. This complied questionnaire includes many overlapping questions that

assist in comparison of responses between the two types of households, on. This compilation of both questionnaires into one form allows the sections on demographics, household makeup, information of questionnaires conditions, as well as knowledge of service provision, to be easily compared. These two household questionnaires also detail the satisfaction and cost associated with their current latrine, as well as the willingness to pay for construction on a new latrine if the household does not currently own one. The willingness to pay and satisfaction can be telling in why and how households build latrines, which in turn can provide insight into the potential and weaknesses of the sanitation supply chain.

Service Provider Sampling Method:

The service providers were chosen in the same purposive technique. The research team would seek out these providers in each of the areas visited to conduct the household surveys, as well in in Arua town in proximity to the SNV head office. It was necessary to use this snowball sampling technique as the locations and number of these service providers are largely unknown and unrecorded in any database.

After making contact with a service provider, the research team would probe both households and service provider respondents to find out the locations of other providers in the areas, which led to the collection of additional service providers. These questionnaires for the service providers were

Details of the Questionnaires

These questionnaires comprise of 5 different forms that cover the range of actors and stakeholders that participate in the supply chain. Interviewing the respondents that these questionnaires target was vital to a gain a full understanding of the current state of the sanitation supply chain in Arua District. The questionnaires included in this research were:

- **Households with a latrine**
- **Households without a latrine**
- **Local construction service providers**
- **Sato Pan consumer satisfaction and ownership**
- **Septic tank emptiers**

These questionnaires were constructed in order to gain an understanding of the current state of latrine coverage, as well as to discover how and why latrines were and were not built.

This compiled questionnaire includes:

- **Information panel (A)**
- **Demographics (B)**
- **House Material Survey (C)**
- **Latrine Ownership (D)**

With Latrine:

- **Latrine Ownership History (G)**
- **Latrine Details and Satisfaction (H)**
- **Service Provision Awareness and Cost of Services (I)**
- **Self-Construction of Latrine (J)**

No Latrine:

- **Attitudes Towards Latrine Construction, Ownership History, Preferences (K)**
- **Service Provision Awareness (L)**

Details on Household Questionnaire sections:

The first five sections of the household questionnaire were created to gain an insight into the different geographical, cultural, educational, and income disparities that exist in the Arua region. These different factors can cause many various positive and negative effects on Latrine construction and accessibility. Factors such as household wealth can have massive impacts not only on the presence of a latrine, but also on the quality, materials used, as well as a determinate for self-construction over utilizing a service provider for construction. This wealth index is simplified to include only the physical construction of the building that the household lives in. Through this simple wealth index, comparisons can be drawn between the households and latrine types, or the existence of a latrine, across the region.

Household Division

Section D is where the questionnaire splits into the two types of household latrine owner ship. These next two sections are detailed below.

Households with a latrine

Those who had a latrine at the time of the interview were asked about the services and locations of materials used in construction, as well as specificity in regards to the methods and price of construction. These questionnaires were vital in understanding how latrines were built at the village level, and what types of services are available locally. This questionnaire also

included a section that detailed self-construction techniques and from where the respondent acquired both the materials and knowledge to self-construct a latrine.

The first section (G) in this part of the questionnaire is about the ownership of the household's latrine. This includes the type of latrine the household has, as well as past latrines the household has owned. Materials, exploration into the factors that influence type of latrine constructed, sharing, and attitudes towards latrines in the community make up the bulk of section G. This section is vital to understand why households build the types they have, ad gives insight into the availability of materials and services in the area.

Section H delves into the satisfaction of the household's current latrine, as well as preferences for their favourite latrine type. This section also looks into where the household gained the knowledge to construct their latrine type, and issues associated with latrine use such as filling up, who in the household decides to build a latrine, and desired improvements for their latrine.

Aim

This section of the household questionnaire is important in understanding why and through what means a household constructed their latrine. Finding what services were utilized, their past latrine ownership history, as well as their willingness to pay for new and more durable materials are all necessary aspects that are necessary to uncover if one wishes to gain a grasp of the current sanitation supply chain. Though gathering data on these aspects, issues of product or service availability as well as attitudes towards seeking out new methods of construction can be found, and in turn allotted appropriate solutions.

Households without a latrine

The secondary household questionnaire focused on what caused households to lack a latrine. This set of questions probed into the availability and knowledge of services in the area, the respondent's knowledge on how to self-construct as well as a section on past latrine use and ownership. Through this questionnaire, the links in the supply chain that are weakest become quite apparent. Geographical hindrances that result in poor knowledge and access to sanitation services and products, and to what extent that they exist, is one of the main focuses of this section, as these geographical hindrances are expected to be a large issue in the facilitation of latrine construction.

Aim

This questionnaire is vital in understand the challenges that both the state and the private sector experience in the provision of sanitation services in Arua district. Discovering why households don't have a latrine is one of the most important parts of this study, as it highlights a majority of the issues that are present in the supply chain, and how they can best be addressed.

Sato Pan consumer satisfaction questionnaire

This questionnaire is used as case study on the penetration and distribution of sanitation products by a private entity. These Sato Pans are imported into Uganda through the company Sanitation Solutions LLC. These pans are then distributed by Sanitation Solutions, yet bringing awareness to the product is often in the hands of development organizations such as SNV. SNV works with LCBs to trigger the adoption of these devices and create a demand for the product. SNV works with LCBs such as PALM, CEFORD, and CARITAS to not only create a demand for this product, but also to act as a local distributers through SNV approved and trained dispensers in the various sub counties of Arua.

Aim

This questionnaire can give insight into how new sanitation products can best be implemented and induced into the sanitation supply chain, as well as highlight the issues associated with the utilization, distribution, and demand of such new sanitation products. This questionnaire can also help map the areas where LCB intervention can be of use in to the supply chain, and where the provision and use of new sanitation products is best left to the free market.

Local construction and service providers (the local private sector)

This questionnaire gathered data from three different service providers that are crucial to the construction of an improved latrine. This questionnaire covered masons, aggregate producers (necessary for the production of concrete for slabs), and concrete slab producers/retailers. These service providers are pivotal in constructing latrines at the village level, and the lack of access to these services can cause poor latrine coverage across the district. This questionnaire aims to see the physical range that these service providers operate in, as well the prices that they charge for their services. The prices and range of operation can be easily compared and analysed through this form which creates a fuller picture of the current state of service provision in each sub-county. The prices that these services charge are to be compared with a section in the household questionnaire that details the willingness to pay and expected cost of service provision.

Aim of Service Provider Questionnaires

The disparity between these expectations and actual charge for service are expected to be one of stopgaps that limits the construction of improved latrines, thus this data will be very valuable to the research. How these service providers acquired the knowledge for their profession, as well as the respondent's knowledge of local competition are gathered through this questionnaire. This aspect of the research is used to explore why there are few service providers in some of the sub-counties of Arua district, which is expected to cause a bottleneck in the construction and upkeep of latrines in the region.

-Masons: Construct the superstructure, such as the walls and roofs, of latrines as well as make local slabs from readily available materials. These local slabs are often made of coconut trees and covered in mud to create a steady surface that sits over the pit. These service providers are very important in the supply chain, and the questionnaire directed at these providers aims to map the availability, location, pricing, experience, and demand of their services.

Aim

Through this questionnaire the reasons that distances that masons operate in, the services they provide, as well the skills and knowledge they have in regards to latrine construction will become apparent. Though this data, any issues that masons face in providing their service, finding customers or materials will be easily seen, and thus a solution can be formulated to increasing their role in the supply chain.

-Aggregate producers: These service providers are an important link in the development of concrete slabs in the supply chain. This questionnaire is similar to the mason's aim in that it seeks to discover demand, competition, pricing, availability, and geospatial location in the region. The construction of proper concrete slabs for improved latrines rely heavily on the bulk extraction of this aggregate. Thus, in order to gain a comprehensive view of the sanitation supply chain and the intricacies of long lasting improved latrine construction, it was important to gather responses from these service providers.

Aim

This survey highlights the mechanisms that the private individuals utilize in the dissemination of products used in the construction of sanitation facilities, namely concrete slabs. The modes of transportation used by these aggregate producers, as well as the range they operate in can provide insight into the expected issues of centralization of the sanitation supply chain.

-Concrete slab producers: There are a few concrete producers that are located around Arua town. These slab producers usually never specialize in only the construction of slabs, and often produce a wide arrangement of concrete items. These slabs are often seen in large concrete shops that mostly sell fence posts, planters, decorative items, as well as contractual foundation and wall construction. These slabs are not widely used according to the SNV baseline study, and a majority of latrines in the region are "traditional latrines" mean that the slab is made from local materials such as fired mud bricks or logs with a mud smear top. Concrete slabs are necessary to prevent collapse in the rainy seasons, as well as for a long lasting latrine. These slabs can also be moved after the latrines fills up, and moved to a new location. The questionnaire that is administered to the slab produces aims to see what constrains encompass to the low adoption of these slabs in the rural areas of the district. This questionnaire aims to find different aspects that should be able to point out reasons that could account for low latrine adoption. When the results of this questionnaire, such as cost and service area, are compared to the household studies, connections between the two groups of respondents will be made clearer.

Aim

This questionnaire is very useful in witnessing the extent of centralization of the supply chain in Arua. Many texts that detail sanitation in the country such as SNV's baseline report mention the centralization of sanitation products and services such as concrete in the urban centres, and through seeking out and interviewing these providers, this paper can confirm or deny the truth to this centralization. If the producers are found to be not centralized, then an easier transition towards inclusivity into the supply chain could be made by these producers. If the producers are found to be centralized, then solutions to spreading the concrete product to more areas in the region can be formulated based on the responses of those interviewed.

-Septic tank emptiers: These service providers specialize in the removal of faecal material from septic systems in the region. There has been an increase in the adoption of septic tanks and systems in the past five years, and these services are starting to become more in demand. Researching this service provider can give an idea about how the sanitation sector adapts and grows over time thanks to the private sector. In the past these emptying trucks were not at all common in the region, and were more reserved to the large urban areas of the country. It is expected to find a connection between the increased prevalence of these emptiers with the increased adoption of septic systems for residential and commercial purposes. The creation of Rhino Camp, a south Sudanese refugee camp spurred by the increase of conflict in Uganda's northern neighbour, has also attributed to the increase of septic adoption. UNHCR has built these septic systems in the camp to keep up with the needs of the residents there as standard pit latrine construction is not sustainable in such a large group of static people. Many of the trucks in Arua primarily work in and around Rhino camp, while some may travel to Congo for work. By researching these Septic tank emptiers, a good example of how the private sector is meeting demand where the government has fallen short is to be expected.

Aim

This questionnaire is useful in finding out the service range of this sanitation service, which can potentially reveal issues in the construction of septic latrines as well as more sustainable sanitation facilities. The frequency and number of septic tank emptiers can cause a blockage in the sanitation supply chain on account of households not constructing these facilities due to lack of service availability. This questionnaire also serves as an example of a relatively new sanitation service that has sprung up from new opportunities for the local private sector in the sanitation supply chain, and lessons could be learned from these interviews in the way of adapting and fostering new private interests to fill in the gaps that are present in the chain.

Questionnaires Collected: Location, Type, and Number

Below is a table detailing the areas of Arua district surveyed, as well as the number and type of questionnaires that were completed in each area. This table shows in what areas each of type of service provider and household type were present, an in what number. This graph is useful in visualizing where there was a lack of service providers, as well as highlighting the impact that LCBs had on the amount of households that currently had a latrine.

District	**Sub county**	**Parish**	**Village**	**# of Questionnaires conducted**	**Type of questionnaires**
Arua	Moyo	Indridri	Ajidiru	12	Sato Pan
			Paanjala	5	
Zombo	Kango (LCB interventions)	Oliri	Achoru	2	Household/**No Latrine**
				4	Household/**With Latrine**
			Alium	6	Sato Pan
			Awindiri	1	Service Provider/**Aggregate**
Arua	Arua Town	Banta Ward	Transport road	4	Service Provider/**Septic Emptier**
		Gruba	Anzevu	1	Service Provider/**Aggregate**
		Kulura	Etoleni	1	Service Provider/**Aggregate**
Arua	Oluko (LCB interventions)	Yapi	Yapi	1	Service Provider/**Aggregate**
				4	Sato Pan
		Ragem	Jokiva	3	Service Provider/**Slab Producer**
				5	Household/**With Latrine**
Arua	Uriama (LCB interventions)	Akinio	Perea	5	Household/**With Latrine**
		Ejomi	Erepea	9	Household/**With Latrine**
				6	Sato Pan
			Odoa	1	

			Adrato	1	Service Provider/**Mason**
		Otumbari	Otumbari	1	Household/**With Latrine**
				2	Service Provider/**Mason**
Arua	Manibe	Guadri	Obopi West	1	Service Provider/**Mason**
		Eleku	Agorovu	1	Service Provider/**Mason**
				8	Household/**No Latrine**
Arua	Ajia	Ajia	Ombamba	7	Household/**No Latrine**
			Pajulu	1	Service Provider/**Mason**
		Ombokoro	Oyeku	4	Household/**With Latrine**
			Andivu	1	Service Provider/**Mason**
Total				19	Service Provider
				28	Household/**With Latrine**
				17	Household/**No Latrine**
				33	Sato Pan

Data Analysis

For analysis of the all the surveys, two methods are utilized.

For the questions on the household surveys that are closed, a coding scheme was developed after the survey were designed. This coding scheme can be seen in appendix five.

For the open style questions that make up the service provider questionnaires, manual qualitative analysis was utilized to code the responses into categories. These categories where then compiled into one database along with the closed questions. As a result of the non-random sampling method of the study, descriptive statistics where utilized to present the data in the findings section.

Quantitative data was gathered from the household questionnaires to find the geographical locations of the services available to the households, which was used to view the availability of

services in a given area. This data also highlighted the origins of the various links in the supply chain such as the hardware stores, masons, and the various other services discussed in sub-question one. Distance of the various links in the supply chain such as concrete venders, as well as distance to latrines is measured in the household and service provider questionnaires, which shed light on the geospatial issues that were expected to be present in the region.

Qualitative data will also be gathered from all included questionnaires, particularly from the households and service providers. These are open questions that allow the respondent to answer in a more flowing and non-restrictive way. These open questions were pivotal in answering the sub-questions posed in this research, such as attitudes towards latrine construction, and the motivations for households to construct latrines themselves, or through a service provider. These open questions were then hand coded in the same fashion as the open questions in the service provider questionnaires and then placed into codes that could be more easily analyzed.

Limitations of Research

There were a few limitations to the study which were encountered in upon arrival in county. The main limitation that was encountered was the issues with transportation to the sites where the questionnaires were to be administered. The sheer distance between the sites and the SNV office in the Arua city limited the amount of questionnaires that could be gathered. This study aimed to have a representative sample of the region, and the issues associated with the delivery of sanitation products and services, yet truly random sample proved to be not achievable due to incomplete demographical data from either the local or state governments.

The cost of transportation to the site, along with issues associated with the condition of roads in the rainy season, which is what a majority of this research took place during, further limited the amount questionnaires that could be administered.

This research team also comprised of two translators that directly translated the responses in person during the conduction of the survey. As is the case with any translation, particularly languages with diffent linguistic roots such as English and the Lugbara spoken in the Arua region, direct translations of thoughts and emotions have the potential to become lost in their true meaning or intention. This can cause some responses to be misinterpreted by both the translator as well as in the interpretation of the researcher. This was mitigated through discussions of certain responses that were unclear with the translators. True these discussions, the ideas that were expressed by the respondents are made clearer, and the opportunity for error shrinks.

The past interventions by the GoU, as well as the by-laws that are in place in the various sub-counties in the region can cause a state of unease for the respondent. Before the conduction of each questionnaire, the translators would put the respondents at ease and inform them that the research team was only there to learn about their current state of sanitation and not to deal punishments of any sorts. This assurance of neutrality and anonymity allowed a more fluid and

frank discussion to occur between the translator and the respondent, which yielded honest responses even about the often delicate and private topic of sanitation practices.

Findings

This section details the findings of the research framed through each sub-question. Through presenting the finding through each of these sub-questions, a cohesive answer to "***How can the sanitation supply chains of Uganda be enhanced so that increased access to improved sanitation services, facilities, and products in rural villages of Arua could be achieved?"*** will be made clear.

Sub-question One: What sanitation services and products are currently available, and what issues do the service providers face in delivering their products?

Products

Arua district is alike to many other districts in the northern part of Uganda. Much of the economic activities are often centered in one large city in each district, and it is in these larger cities that most of the economic activities are centered. These regions in the north are also a considerable distance away from the capital of Kampala, which is where the majority of new products are delivered and distributed to the rest of the country. Therefore, the supply chain of most foreign products start in Kampala, which includes sanitation products that are introduced by both international organizations and private interests and companies. The dissemination of these products is one of the aims of SNV's sanitation department.

The questionnaires administered had questions that probed into the respondent's knowledge of sanitation products and services available in their area, these questions can be seen in Annex One. The knowledge that the responds had about sanitation products were pulled from sections **I** and **L** in the questionnaire mentioned above.

Sato Pan

The Sato Pan is used in this study as an example of how a sanitation product can penetrate the supply chain, as well as how the product is moved through the chain to ultimately end up in the hands of the consumers. The Sato Pan also serves a role in sub-question five about the levels of consumer satisfaction towards sanitation products and services. These levels of consumer satisfaction are handled more thoroughly in that sub-question, but this section details how the Sato Pan was found by the consumer, as well as the issues that exist in the pricing, attitudes, installation, and dissemination of the product.

When it comes to solely products that are available, the Sato Pan was the only product that most were aware of. There are also a few mentions of knowledge about plastic slabs, though the respondents that stated to know of these slabs were only service providers, not the consumers. On the matter of sanitation product dissemination, SNV focuses mostly on the Sato Pan. The Sato Pan is a product designed by the pluming manufacturer American Standard that is placed in the hole of the slab in a latrine and creates a seal from the pit into the interior of the latrine. Examples of these Sato Pans can be seen below. These devices are sold for around $2.50, and are designed to be durable enough to last 5 years of use and multiple reinstallations.

The picture on the right shows the Sato Pan as it is pre installation. Notice the flap that hangs down below the plastic body of the pan. This flap is weighted with a bit of concrete or dirt that allows the flap to be opened with the force of feaces or water, which opens to let the waste down into the pit and then springs back to create a seal. This seal stops the proliferation of disease vectors such as flies from touching the contents of the pit and then moving to a source of food in the homestead. This Sato pan also limits foul odors from being emitted from the pit, as well as providing a cover on the hole that stops small children and animals from falling into the pit. This product can lower the incidence of diseases related to contamination of edibles in villages, reduce accidents related to open pits, in addition to providing an easier surface to clean, as the plastic makeup of the product creates a smooth and visible surface to clean away waste.

At the present stage, the Sato Pan is delivered and distributed predominately through the efforts of NGOs in Arua district. SNV has led the charge to distribute the product throughout the region, utilizing other smaller NGOs such as PALM, CEGED, and others, to distribute the product in the areas that are distant from the city of Arua, and in kind, SNV's regional office and distribution point. SNV has been engaging various hardware stores and dry-goods shops to foster interest in these private individuals to sell the product, but this endeavor is still in its

infantile stage. There has been a lack of interest in the product by these private business owners for the most part, largely as a result of simply not being familiar with the product. The Sato Pan is a relatively new product in the market, which causes a lack of assurance in the profitability of the product to many of these shops. Though, as the Sato Pan is becoming increasingly more prevalent in the country thanks to the endeavors by SNV as well as Kampala based NGOs such as Water for People, more shops are beginning to take interest in the product, and in turn more consumers are becoming interested as well.

Though the Sato Pan is one of the premier sanitation products in Uganda, and the popularity and satisfaction of with the product is quite high from those surveyed in this study, (consumer satisfaction with the Sato Pan and other sanitation services and products are detailed in sub-question five) demand is naturally only high in areas of the country that knowledge of the product. SNV is looking into the production of radio adverts that detail the product so that the demand and dissemination of the product can continue to grow, for both the benefit of the populous, as well as NGOs and the private sector alike.

Since the product is still relatively new and unknown, various issues arise once the product becomes available for purchase by consumers. The first of which is the basic knowledge of how the product is to be utilized. The NGOs that SNV utilizes to distribute the Sato Pans are not specialized in the sales of products in the same vein as private shops and shopkeepers. SNV informs the local NGOs about the uses and features of the product, as the product is also new to the NGOs, and the NGOs are tasked to bring about interest and demand creation for the product. While the NGOs are instrumental in creating awareness, this approach should not be held as a long term method for the dissemination of the Sato Pans. One of the compelling reasons for keeping this approach limited only a transitional method is that these are NGO employees, not salesmen or individuals interested in seeking profit through the increased presence of the product in the market. Individuals that have an interest in selling off the stock of Sato Pans, or even committing to some form of word of mouth advertising around the shops area of operations, would have a better chance of proliferating the product in the surrounding areas. Examples private shops outperforming the NGOs in this regard were seen in two diffent instances in Arua district.

SNV identified two different shops to sell the pans in two diffent towns in Arua district, both of which sat on the edge of an inter-regional highway. The first was in the town of Nebbi. This shop was a hardware shop that sold various metal fittings, tools, construction equipment, and various other odds and ends. The shop keeper was approached by SNV as one of the premier shops to sell the Sato Pan in the region, and so far the results have been very impressive. This study found that Nebbi had the third highest adoption rate of the Sato Pan in the region, followed by Moyo and Kango in the northwest. SNV has surveyed the Sato Pan users in Nebbi, thus Sato Pan questionnaires were not collected in this area. SNV Arua directed the collection of the Sato Pan questionnaires to the sub-counties of Moyo and Kango, which were not yet surveyed but were areas where SNV and other NGOs such as Palm had distributed the Sato Pans.

SNV distributed the Sato Pans to a shop in Kango sub-county, and the sales of the product have also been very high. Many motorists pass by the shop on the way to the western areas of the county, or even beyond into Congo. The shop displays the Sato Pans outside, and the owner of

the shop stated that many of the pans sold are to these motorists, and that many of the customers bought 5-10 pans at once so that they could start selling them in their own villages and trading centers. The shop owner would describe to them the product, along with the various features and installation instructions, so that they could utilize the product in the proper manner.

The Sato Pans in Moyo were distributed by the NGO Palm, yielding great results in Sato Pan coverage in the region. Palm has performed very well in not only distributing the pans to the villages and parishes, but also in raising the awareness in the product. This study collected questionnaires mostly from areas where Sato Pans were installed, though the research team began to notice an increasingly observable issue on the topic of installation the further the study progressed. As a result of this issue, a new version of the survey was designed to gather insight into why these pans were not being installed.

Through these surveys, it became more apparent that the installation and usage issues with the Sato Pan stemmed from the issue raised above, meaning the staff of the various local NGOs, apart from Palm, had not been describing the features and utility of the product adequately to the consumers. This lack of information about the product may stem from the NGO staff not being fully informed of these features, or from a different perspective on the dissemination of the product when compared to a purely entrepreneurial enterprise such as the local private sector (hardware stores). The amount of Sato Pans distributed in regions with a private market for the Pans were usually higher those that relied solely on NGO presence to distribute the pans. This is an interesting correlation, yet the case of Palm in Moyo sub-county provides evidence that an NGO can perform just as well as the private sector in some cases, though this was an isolated example in the context of this research.

From the questionnaires collected from those that had received a Sato Pan but had not installed, there were two main issues that kept appearing in the responses which stopped the consumer from utilizing the product:

Installation:

Out of those that had not installed the pan, 6 out of 8 stated it was because they didn't

1. Didn't have knowledge about how to install the pan themselves (without a mason).
2. If they did know how to install, they didn't want to cut the wood in the traditional slab, fearing that the slab would collapse.

This first aspect of the installation issue stems from the lack of interest in the local masons. The respondents stated that the masons they would talk to either thought that the trip to the customer was not worth the small about they would gain from installation (around $1.75), or the masons themselves did not have the knowledge to install the Sato Pan. Some of the local NGOs that distribute the Sato Pans, such as CEGED, often train a few local masons in the method to install the Sato Pan, though this method usually details cutting the logs in the traditional slab. They also describe this method to the households, but many respondents described worrying about collapsing the slab if they attempted to self-install. One of the solutions to this issue is to teach both the masons and the households to install the Sato Pan on

bricks over the hole in the slab, and to use mortar to seal the area around the Sato Pan and the slab. This method means that there is no cutting required for the installation onto the slab, and it takes less time to install by masons, potentially increasing the interest on their part. Below on the left is an example of this method, compared to the picture on the right of the method that is usually taught by the NGOs.

The rest of the respondents that didn't install the Sato Pan (8 out of 33) stated that they were waiting for their current latrine to fail or fill up. This behavior is also caused by a lack of information on the reusability of the Sato Pan. The Sato Pan is designed to last 5 years of use, and is also designed to be durable enough to be reinstalled in latrines multiple times. When the research team informed these respondents of this feature, all stated that they did not know. This feature is one of the aspects of the Sato Pan that make it marketable to countries such as Uganda, where latrines often don't last years on end. The low cost of the Pan as well as the reusability needs to be stated more clearly by the NGOs, as the respondents who did not install the Sato Pan for this reason all received the Pan from a local NGO.

The areas that had the highest install rates were also the ones that were sold by a private shop. The respondents and their issues described above received the Sato Pan from one of the local NGOs, providing an interesting insight into the difference in end consumer utilization between the two methods of product delivery. It seems that when an individual buys the Pan from a shop, they gain a better idea about the features, how to install, as well as insights into the reusability of the product. The case of Palm and their success in achieving such high levels and adoption and installation is an interesting outlier, though overall it seems that the private sector

has a better success rate in the context of the Sato Pan. As a result of this finding, it can be said that pursuing more independent stores and hardware shops is a worthwhile endeavor for the larger NGOs in the region, including SNV.

Concrete slabs

Another sanitation product that is very important in securing the sustainable production of latrines in the country is that of the concrete slab. Most of the latrines in the rural areas of the country utilize locally sourced materials for the construction of the slab. These “traditional latrines” most often use logs from trees in the village to create the slab. These logs are then laid out in rows, cut with a saw in the middle to create the hole that allows waste to go into the pit, and then these logs are smeared with mud in order to create a relatively smooth surface for the top of the slab. This type of slab is prone to failure and collapse through rains, weight stresses applied through daily use, as well as rot caused by the high humidity environments that are common in many areas of the country.

Example of a concrete slab

These traditional slabs are quick to create and install, and most importantly, very affordable for the rural residents who are often in the lower earnings of the country. Though as already mentioned, these slabs have the tendency to fail in the first two years that they are installed.

The alternative for this slab is a slab constructed from concrete. These slabs are very long lasting, and can even be moved to a new pit once the previous put fills up with waste, or is otherwise rendered unusable.

One of the main issues facing the procurement of these slabs for the rural population is availability of concrete or a premade concrete slab. Those who produce concrete, and in turn produce the slabs for sale, are mostly located in city centers. The rural population most often utilize bicycles or walk to the city, and these slabs are too cumbersome to be moved by these methods of transport. Renting a car or truck to move the slabs is quite expensive, and those who produce the slabs and concrete have very little interest in delivering the slabs to the rural areas of Arua, as is evidenced in the service provider questionnaires further down in this section.

The alternative to the premade slabs is for the rural residents to purchase the concrete and make the slab on site at their homestead. This method can overcome the cumbersome premade slabs, though the purchaser of the concrete or a local mason must have knowledge of laying concrete, which is not quite common in rural areas where most building foundations are created with mud covered bricks.

It is clear that while the concrete slabs can extend the lifetime of a latrine by many years, procuring the materials necessary for the installation of the concrete slab is an issue unto itself. Potential solutions to the issues that rural dwellers face in the procurement of concrete is discussed below in the Service section about masons.

The difficulty with the dissemination of products such as the Sato pan are at the root of this research. Discovering what causes the low adoption and more importantly, knowledge of sanitation products, especially ones that are relatively affordable and well received in rural populous such as the Sato Pan, is key to finding a solution that has the potential to increase sanitation coverage in the country.

These two products were chosen as they were found to be the most prolific in the region through data gathered from the preliminary questionnaires, as well as through the advice of the SNV of both the Arua and Kampala branches. These two products therefor served as a focus to highlight the difficulties and blockages that exist in the supply chain for Arua District.

Services

A variety of methods and service providers exist that are necessary to the construction of a latrine. These service providers were identified before the start of the research as vital parts of the rural sanitation supply chain and in turn, the construction of latrines. As the research progressed, it became clear that not only the utilization of these service providers was not always common, but also the existence of some of these predicted services providers were also in question. This section details each of these service providers, as well as their role, or reasons for their absence, in the sanitation supply chain in Arua District. These service providers are as follows;

Masons, who often construct the walls around the pit and in some cases the slab as well.

Pit-diggers, who dig the waste pit that will become covered by the slab.

Pit-emptiers, who empty septic system tanks where waste is stored.

Aggregate producers, which crush and deliver one of the main components used for the production of concrete.

Concrete producers, those who utilize the aggregate and other materials to produce concrete products, including the concrete slabs.

Masons are often an important service to the construction of latrines in the rural areas of not only Arua District, but also throughout the country. It was expected before the collection of questionnaires that these masons would construct many latrines in these rural areas, though through the data gathered it became clear that these masons often focused on the production of houses and other buildings, and seldom constructed latrines on their own. Those that did construct latrines often only did so if hired to construct larger structures in the same job. These masons explained that the wage gained from the construction of only one latrine at a time was often not worth the trouble of transporting the bricks and equipment across the parish. This lack of interest on part of the masons has led many individuals in the region to self-construct the latrines, which leads to the collapse of the walls in many cases on account of the unspecialized construction of the structure.

Bricks utilized by masons

Many of those that self-construct the latrines learned how to do so through their families, and those in the community that have the knowledge and skills necessary to construct the structure. The questionnaires revealed that many of those that self-constructed the latrines were using

the same methods and materials as their grandparents or even great grandparents had utilized. This sort of practice can create a somewhat sizeable latrine coverage in villages, yet these latrines often fail in the first year, causing the household to share a latrine with their neighbours, or revert back to OD practices. These alternative options that these households fall back on create a self-perpetuating lack of latrines in many villages that were covered.

The residents often stated that it was almost futile to make a new latrine as they saw the latrines they built as bound to fail once again. Some of the residents polled stated that they see the construction of new latrines a waste of precious funds, energy, and time. This attitude and failure rate of the latrines is caused by poor construction practices and lack of knowledge on how to improve the latrines further. These skills can be taught by the various NGOs operating in the district of Arua, and some NGOs such as SNV are teaching construction techniques that can be used to create a longer lasting latrine as well as create some semblance of sustainability in regards to the future of latrine construction in the village.

The soil textures range greatly in Arua district, which can create many different issues for latrine construction in the region. Some soils are very dense and rocky which can digging the pit very difficult, while other soils are very sandy and porous which can lead to collapse through excess rain entering the pit, or through the ground around the base of the pit. SNV has created these info graphics to show not only how to overcome these various soil conditions, but also highlights how to do what is called alternating pit usage. This method is designed to be taught to both masons in the community and households alike. The general principle is to create to well-constructed pits, as described in the previous info graphic, and to move the super structure between them as they fill up respectively. Though this method one of the pits is left covered so that the waste has time to decompose, then by the time the pit in use is filled, the covered one is then reopened and used once again. This cycling of the pits allows a sustainable availability of pits, which is often the most work intensive aspect of latrine construction.

Pit diggers are not as common as expected in the rural areas of Arua district. As mentioned above, most of the pits dug were by the homeowners themselves, or in rare cases, the households paid some youths around the village to dig the pit. Out of all households surveyed only 10% had some other individual outside the family unit dig the pit. The cost per foot averaged out at around 10,000UGX ($2.73). Self-digging the pit has the same inherent issues as self-constructing the walls around the pit, as these pits are most often not reinforced, or are dug in improper soils. This type of work is not a specialized trade, and if the household didn't dig it themselves, it is often the mason who would dig it with a group of fellow masons.

The average depth of the pit was 12.3 feet, though 22% of the respondents had pits that were below 7 feet. The graph below displays the different reasons for the failure of the respondent's last latrine. The latrine filling up makes up a hefty percentage of the latrine failures, highlighting the need for improved methods for pit reinforcement, soil texture consideration, as well as highlighting the importance of a roof on a latrine.

Examples of latrine pits

The roofing of the latrine is especially important in reducing the chance of a latrine collapsing or filling up. Uganda has an average rainfall of 100cm per year (EU Water, 2015) and without a roof, much of this rain has the potential to enter the exposed larine pit. This rainwater can lead to the rotting of the logs in the slab, the pit to filling up with water and overflow, as well as cause the pit to washout and become unusable. SNV highlights the importance of these roofs to those villages that the organization is working in, and many of the latrines that were observed in the research had some form of a roof to keep the water out of the structure.

Pit-emptiers utilize massive pump trucks to withdrawal waste from the septic systems around the region. There were four different companies that were identified in the region that specialized in the removal of septic waste, and of these companies only one had more than one vehicle and the largest of these companies is the Right Brothers cess pool empting service. The removal services can be quite pricy in relation to the average income of the region, which is

often a result of the distance that these pit emptiers must travel to the sites around the region. The average cost to remove the waste is 100,000 UGX, or $27.09, while the cost to empty the truck is on average 20,000 UGX, or $5.42. These truck drivers mentioned many unique issues that they face in their profession, such as the increasing cost of empting the truck. All of the companies surveyed stated that they all used one empting location in Jiako-Dadamu sub-county, whose owner is accused of price-gouging as a result of the limited availability of dump sites. One man has a monopoly on the waste dumping site in the entire Arua region, and the pit-emptiers have all stated that he has been raising the price every year.

There are also social stigmas that are present in this profession. The drivers of these trucks all mentioned strong displeasure with the job and they state it is, understandably, unclean and dirty work. It is also seen as shameful and a non-respected profession to drive faeces around, which can cause many drivers to come and go in the profession, which limits long term experience for the drivers, and expansion opportunities for the company owners as a result of this high turnover rate.

The cost of the trucks that can empty the tanks are also a huge barrier to entry into the market. These trucks cost around 80 million UGX, around $21,709.60. This is a very high price that only the wealthiest in the region of Arua can afford to pay, and those that can pay this massive cost tend to choose other investments, particularly the procurement of land and more stable and in demand businesses such as supermarkets and restaurants. These trucks are imported solely from China, and the GoU offers no tax breaks or incentives for the importation of these vehicles, leading to the trucks to become quite expensive in relation to both their purchase and operation.

Examples of Pit-emptying trucks

These trucks are also only available for purchase in Kampala, with no regional distribution systems in place. Thus, areas that are far away from Kampala have limited availability to these trucks, which can cause a low availability of the service in many remote areas. This is most often a result of long waiting times that stem from both the distance needed to for the trucks to travel, as well the question of if the trucks are available for dispatch in the first place which stems from wait lists and mechanical issues that the trucks often experience from travel on the rough or flooded roads.

In regards to driver experience, the drivers expressed that difficulty of driving the trucks loaded with waste, as the semi liquid state of the waste can cause handling issues during transport. Taking a sharp corner can cause the weight to shift dramatically, which heightens the risk of accidents such as overturning. The high turnover rate of the drivers compounds the risk of accidents as many drivers are not used to transport liquid or semi liquid loads, and they must be trained by the limited drivers that have been a part of the company for some time.

There are also issues in this service in relation to the wages and profit sharing. Many drivers want to own their own trucks, yet the massive upfront cost stops them from purchasing one. The drivers of these trucks tend to only make 15,000 UGX ($3.89) per trip, which the drivers' state is not a fair wage for the amount of work that goes into the travel and work, which can often take most of a day. These wage concerns are a difficult issue to fix without regional or state oversight, both of which are fledgling in the region.

Aggregate producers are individuals, most often women, which crush certain types of stones to be used I the production of concrete. This group was studied as a way to gain a perspective on how the supply chain operates in Arua district. The way that the materials are sourced and then transported to the city of Arua provided interesting insights. Much of these aggregate producers were located in the periphery of the city, where the stones were extracted from the hillsides. There were two different qualities of aggregate observed throughout the duration of the research. The primary one was a dark stone that was reminiscent to granite. The other stone had a whiter texture and was described as being a higher quality component for the production of concrete.

An aggregate producer at work

The stones would also be gathered in piles and placed alongside the busier roads in the region where individuals that worked in the trade would drive by and purchase a truck bed full of the stones. These stones would then be transported to the city of Arua where they would be further crushed, or sold at a mark up to the concrete producers if the transporter was not affiliated to the concrete producer. These stones sold for around $1 per 15 kilos for the aggregate of less quality, and for $1 per 7 kilos for the higher quality. These are the prices that the producers sell to the middlemen transporters, though the prices the middlemen sell to the concrete producers was not determined.

One of the main findings gathered from the questionnaires distributed to these tradesmen was how centralized the concrete industry is in the region. Any sort of large scale concrete producers were never witnessed outside of Arua proper during the duration of the research. The large building that existed in the trading centres were built in much of the same way that the latrine walls were, as in with brick and mortar and smeared with mortar and sometimes painted with advertisements. What was gained from this segment of the questionnaires were how very centralized the supply chain is in Arua city. The only place to acquire concrete is in the city centre, and those that produce it don't have stated that they have no desire to expand the business further to reach more rural communities that borer the city of Arua.

Concrete producers are spread around the city centre, and only three large scale producers were identified in the city. These concrete producers focus on the production of various products such as planters, fence posts, decorative objects such as statues and birdbaths, as well as concrete latrine slabs. Of the three producers interviewed, none of them had plans to expand past the city limits, all were content in the current method of customers finding their products, and all were satisfied in the number of customers that they received in a two week period. One of the interesting findings, which was also highlighted in SNV's baseline report, was that many of the concrete producers didn't often focus on the production of concrete slabs. These slabs were often considered an afterthought in comparison to the decorative items or planters. The concrete producers stated that they often didn't see the economic incentive to produce a lot of slabs, much less transport them outside of the city limits.

This lack of production and transport is seen to be caused by both the consumer as well as the producer in a sort of push-pull demand structure. These concrete producers don't make slabs often from the lack of sales in comparison to the other products, and the consumers don't purchase the slabs as a result of a multitude of factors ranging from limited awareness of the product, lack of a willingness to purchase a slab as they don't find it necessary to upgrade, to purely transportation issues. Though these factors are beginning to change as of late, and these producers have stated that sales of slabs are higher now than in the past 2 years, and new concrete companies are beginning to pop up around the Arua city.

Throughout the duration of this research, no concrete producers were observed in any location outside of Arua city. This is most likely caused by low demand in the rural areas for concrete, compounded by the specialization required to produce the concrete is not common among the smaller parishes and villages. Those who do know how to produce and form concrete, or wish to

learn, move into Arua city for better opportunities, as well as for the demand that the city creates in relation to concrete services and products. This sort of brain drain is not uncommon in developing states, and is often a very hard issue to tackle.

The three large concrete producers have been making slabs for a number of years, yet they stated that they sold seldom in the past. Now there has been an increase in demand for the slabs around town, which could coincide with the increase in NGO activity in the area in the past 10 years. This increase in demand has also led to the formation of new concrete companies, yet these operations are still small scale, and focus mostly on building repair and decorative items.

Sub-question Two: To what capacity do local, regional, and national actors interact to provide sanitation products and services?

To formulate methods to improve the sanitation supply chain in Arua district, a look into the actors involved in the present sanitation sector is crucial. This section will detail the actors presently involved, the methods currently used in sanitation development by these actors, as well as explore potential solutions that could be provided by increased and more efficient private sector involvement.

Rural sanitation development in the region is undertaken by a multitude of actors that cooperate, as varying levels of efficiency, in order to bring about positive chains. The first steps of the supply chain mentioned in the theoretical framework (triggering of households, and lack of state services) is most often started by local and international NGOs in the region. This is a result of the fragmented nature of how the national, regional, and local implement, monitor, and fund sanitation solutions and policies. Given this decentralization, in the rural areas" it is the responsibility of each local government to prioritize (or not prioritize) sanitation. The extent of promotion and enforcement by local governments varies widely" (World Bank, WSP and AMCOW, 2015).

Thus, the NGOs in the Arua region such as SNV, Caritas, CEGED, and the UN undertake the triggering of the local villages so that demand for improved sanitation facilities can be created. After this demand is created, masons from around the parish are often requested to build the latrines, most often sourcing from local materials. If these masons are not present, NGOs such as SNV's local youth development plan, can afford young individuals to learn the trade, as well as provide the villages and parishes increased access to the sanitation construction services.

The triggering is often undertaken by SNV in the Arua area, and is a shocking spectacle to see for the villagers and the uninitiated alike. These types of triggering mechanisms, such as the display of human faeces gathered from OD areas in the village, are designed to induce shame in the village, which is designed to create a local demand for latrines. The NGOs that initiate the triggering use this demand in the villages to institute a village promise the households there will build X amount of latrines during the next X amount of months. The details of the variables in the village promise are decided by the NGOs based on the amount of households in the village,

as well as with the amount of tradesmen, such as masons, that are available to construct the latrines.

There are individuals from differing organizations and elected positions that monitor the progress of the villages, and mark down how far the village has progressed toward meeting sanitation promise. The individuals that do this observing may come from NGOs, or they may be individuals that work in the local sub-county office. Often the sub-county will delegate certain leaders in the villages to both monitor and encourage the village to meet the goals, as well as offer solutions in case difficulties arrive in the creation of the local latrines. Village chiefs, and Parish chiefs are very important in this regard, as the NGOs and the sub counties are often strapped for resources and staff to monitor the progress, or address all of the issues that can arise in the construction of latrines. These chiefs are often respected members of the villages and parishes, and the majority of the residents hold their words and leadership in high regard. This local bottom-up structure of leadership and organization creates a reasonable state of progress, mostly in the context of "capacity building."

Capacity Building and the potential of the private sector

The aim of SNV, and many of the local NGOs in the region, in the context of their WASH program is that of the aforementioned "capacity building." This policy arose largely from the UNDP's 2008–2013 "strategic plan for development," and is a shift away from the development policy that was popular during the mid to late 20th century. SNV has taken this method of development, and in turn aims to create a form of "inclusive development" in their WASH program. The steps of this approach are a useful guide in describing how SNV and other organizations, private and public alike, cooperate to reach the goal of improving rural sanitation. This outline also can highlight areas that the local private sector can improve, while remaining in the context of building the capacity of the region to develop improved sanitation and strengthening the sanitation supply chain.

1. Engage stakeholders on capacity development

The first step of this process is one that is vital to begin the process of providing a stage for the private sector to perform in improved sanitation delivery. The UNDP gives a summary of this premier stage as:

"An effective capacity building process must encourage participation by all those involved. If stakeholders are involved and share ownership in the process of development they will feel more responsible for the outcome and sustainability of the development" (UNDP, 2008, 4).

This stage engages the local populous in the creation of sanitation facilities, where the stakeholders range from the household level all the way to the sub-county or regional level. This sort of development method creates many links of reliance and provision between actors that can form a sanitation supply chain by including all who benefit, and creating space for new

coming actors that can provide increased cohesiveness in the chain through sanitation service and product delivery. Through the interaction between the households, local and regional leaders, as well as private interests such as NGOS and service providers, each partner comes together to create the realization of improved sanitation.

2. Assess capacity needs and assets

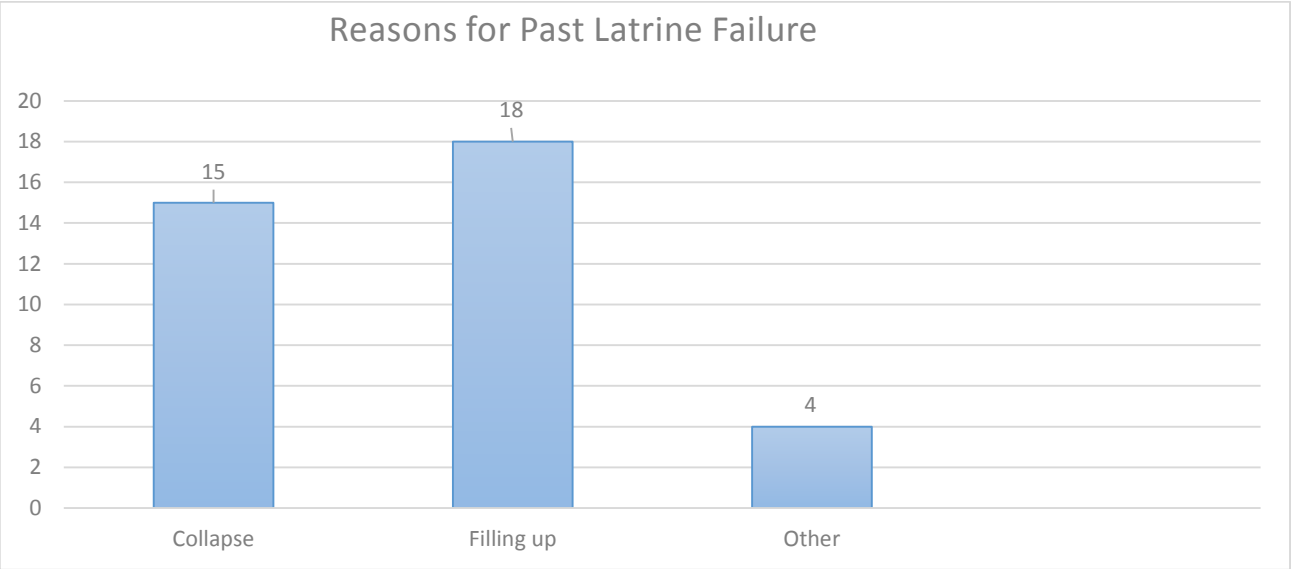
This stage in the concept provides the basis for the opportunities that the private sector has in increasing the provision of sanitation services and products in Arua district. The UNDP states that this stage requires:

"Assessing pre-existing capacities through engagement with stakeholders allows capacity builders to see what areas require additional training, what areas should be prioritized, in what ways capacity building can be incorporated into local and institutional development strategies." (UNDP, 2008, 5)

SNV assess these capacities through a few different mechanisms, one of the ones that is used the most often by the organization is the Baseline study that was conducted in 2014. This study highlighted which areas the different sub-counties and parishes in the region were lacking in, and through this study it is possible to develop a view of how the private sector can be strengthen to cover the gaps that exist in improved sanitation provision. One of the first ways that the private sector can get engaged in the construction of latrines is the creation of demand through the triggering mechanisms mentioned above. While triggering the villages creates household demand, and in turn draws masons to the area to construct the latrines, one of the issues present is how the masons view constructing latrines in the first place.

As described in the overview of masons in sub-question one, many masons don't see the profit in the construction of latrines, and would rather construct larger structures. The household questionnaires discovered that around 60% percent fully self-constructed their latrines, and that around 41% failed by collapse. Below is a chart that shows the different causes for the failure of latrines, as reported by the 37 household respondents who had a latrine in the past.

Figure Seven: Reasons for Past Latrine Failure

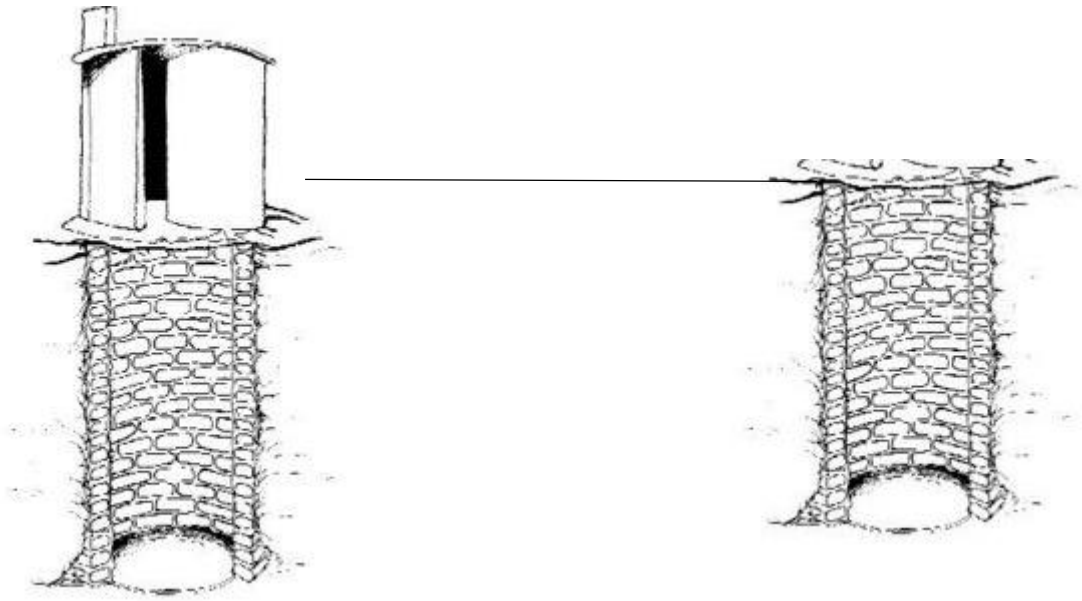


It is clear from this graph that the pit is the main point of failure for the households. Though filling up is also highly represented on account rain water entering the pit from a lack of a roof, which was 6 out of the 18 respondents. Digging the pit too shallow to where it fills up is caused by the same issue as what causes collapse, where the households don't dig very far as they are accustomed to the latrine failing before it fills up. The households are accustomed to the latrine collapse on account of the construction practices used in the creation of the pit, including the lack of reinforcement around the exterior the pit.

These two issues in the pit construction have the potential to be solved by NGOs training households, as well as masons, in these more advanced construction techniques so that pits can last longer without filling up or failing. There is a decent amount of willingness to pay for latrines that last longer. This willing ness to pay is covered more in-depth in sub-question four, but broadly speaking around 80% percent of the households surveyed stated that they have a willingness to pay for a new latrine pit, and that the average amount that households are willing to pay 72,000 UGX, ($19.58) which would be above what the masons currently charge for latrine construction. The training of masons in these construction methods also opens the door for the masons to become specialized in their construction, creating a willingness for others to pay for their specialization, as well as fostering interest in the masons themselves in constructing more latrines, as the demand for their improved service provision would be more apparent.

Utilizing methods such as the circular reinforced pit design, which when combined with another pit of the same qualit these issues can be solved. Below is a rep

Figure Eight: Depiction of Alternating Circle Pit design



When one of these pits fills up it can by covered and left alone for a year while the faeces has time to decompose, while the other pit is reopened and utilized in the stead. This rotational use ensures that a latrine is constantly available, while offsetting the construction time of a new latrine. Training masons and households this method of latrine construction, particularly with a concrete slab, can create a long lasting a sustainable form of improved sanitation in the rural areas of Arua, while also creating an entry way the private sector, such as the masons and concrete producers, to meet the demand of new latrine facilities.

One of the other services mentioned in sub-question one are concrete producers. One of the main issues associated with this service the centralization of the producers in large urban centres such as Arua city. The concrete providers surveyed stated a clear lack of interest in expanding the products outside of Arua city, but this expansion of the producers themselves may not be necessary. There is an opportunity in this lack of expansion for a sort of delivery of concrete mix throughout the region by another company, as long as there are masons in these areas who are trained in creating in-situ slabs.

SNV as well, as vocational schools in the region, have training sessions for the development of trades in the region. These vocational training programs have the opportunity to expand, and create a method to where the masons, or even households, are trained in the concrete slab installation as well as the aforementioned pit construction. In question B1 in the service provider questionnaire, “Have you considered making slabs?” those who didn’t already make the slabs, which was 5 out of the 15 surveyed, all stated that they had a desire to learn how to make them but had no current knowledge on the process. Those that did currently make slabs already have the knowledge on how to make the traditional slab type, so training in the utilization of concrete for constructing a slab has the potential to be adopted as a part of their already demonstrated repertoire of slab construction techniques. If these local craftsmen were

to have the knowledge to utilize concrete, only the availability of the dry mix is necessary locally, meaning the production centres are not necessary to be localized around the villages and trade enters.

This sort of transportation of the dry concrete mix can be done with the same sacks utilized in charcoal production, where only small amounts of water are necessary to create an in-situ concrete slab. Promoting this practice with transport drivers and trade centres along the main roads has the potential to increase the supply of concrete in non-urban areas, even if only transported in small amounts. Training the masons to install concrete in addition to having even a limited amount of concrete mix available locally can create opportunities not only in the production of in-situ concrete slabs, but also in other uses of concrete such as foundation construction.

Those that produce concrete all stated that they learned from a trade school, or from a foreman on the job that learned from a school. Two of the interviewed concrete producers which are located in Arua city stated that they learned from a trade school in Moyo, which is about 115km away. This sort of centralization of the concrete producers provides even more evidence of the necessity of the creation of a transportation chain through the region.

3. Formulate a capacity development response

A. *"Institutional arrangements – assessments often find that institutions are inefficient because of bad or weak policies, procedures, resource management, organization, leadership, frameworks, and communication."* (UNDP, 2008, 6)

This aspect of step 3 is very useful in describing where the supply chain breaks down in the delivery of sanitation products to the consumers. The national and local level institutions in the context of Arua are quite weak in the provision of basic sanitation service delivery, much less improved sanitation. One of the main issues that plagues the local institutions is that the by-laws (rules set in place to enforce various aspects of society, such as property lines and sanitation) differ immensely in each sub-county. One sub-county may have by-laws that are specific to sanitation such as every homestead having at least one latrine on site, while a sub-county not even 10km away may have no such laws at all while the demographics and population of both respective sub-counties are in large identical. Some sub-counties have strict by-laws in place that deliver consequences to households that are found to be without a latrine by the staff of the sub-county. These consequences can range from a fine, to the confiscation of property, namely livestock. The levels of improved sanitation in areas that had these strict by-laws were observed to be far greater than sub-counties that did not have such by-laws in place.

The vast differences between sub-counties can create stark differences in the levels of sanitation, akin to whether or not a community had been "triggered" or had other interventions by local NGOs. This lack of cooperation, especially of the regional government of Arua, causes a fractured relationship between all sanitation developers in the region. Sub-counties in Arua also require strong leaders to assist in the both the development of sanitation in the region, as well as instituting a cooperation between to themselves and the regional institutions.

Strong leadership is perhaps one of the most critical factors in the proliferation of sanitation in these rural areas, but this factor is one that is not only very difficult to foster and improve, but it is also very difficult to quantify. The UNDP describes the importance of leadership in the words:

B. "*Leadership by either an individual or an organization can catalyze the achievement of development objectives. Strong leadership allows for easier adaption to changes, strong leaders can also influence people"* (UNDP, 2008, 7)

As mentioned at the start of this sub-question, having respected village and parish chiefs is every bit as important to the development of sanitation as is a strong sub-county chairman. Moyo sub-county was a great example of this, as through off-record discussions with the villagers and leaders of the local communities, it was clear that the respect and the relationships that the leaders had with the populous as well as with each other had quite positive impacts on the sanitation levels of the community. Moyo also had by-laws set in place, and this sense of strong leadership coupled with these by-laws were the most apparent causes of the success that the sub-county had in improved sanitation development.

These sub-counties that had by-laws in place also were found to have higher incidences of masons constructing latrines, as gathered from the questionnaires. Section **J** in the household questionnaire asks the respondent how they constructed various aspects of their latrine. In sub-counties that had bylaws, such as Oluko and Uriama, 10 out of the 14 households stated that their latrine was constructed by a mason. While in sub-counties such as Aija and Kango, who don't have these by-laws, only 3 out of 13 hired a mason for constructing their latrine.

This example highlights a correlation between the prevalence of masons in areas with by-laws, who often construct longer lasting latrines based on the data gained from form 2 of the household questionnaire. When asked "How long have you had this latrine," respondents that utilized a mason had a marginally higher response than those that self-constructed. This difference was only around 8 months longer that those that self-constructed, but an interesting observation none the less. The correlation between the prevalence of these masons was also intriguing to the research team, but more research must be done on this phenomenon, as the by-laws most likely only one such factor in this correlation.

The final aspect that the UNDP mentions in this step, which is strongly ideologically shared with SNV, is that of accountability and monitoring. The UNDP states that they"

"Promote the strengthening of accountability frameworks that monitor and evaluate institutions. They also promote independent organizations that oversee, monitor and evaluate institutions." (UNDP, 2008, 12)

SNV, as well as local NGOs such as CEGED, work alongside the sub-counties to monitor the progress of the programs that the NGOs have instituted, as well as how monitoring the adherence to the by-laws of the sub-county, should they be in place. Data is shared between the various organizations and local government, yet the sub-counties are the only ones who

deal out punishment to those found in violation of the by-laws. If reasonable work is being observed on a homestead by the sub-county monitors, then these laws are usually a bit more lax. Latrines can sometime take months to build, and the sub-county is often aware of this trend. Though, if the household takes too long to construct, or is not progressing they may hand out punishment to the household head.

Masons tend to build the structures quicker that when a household self-constructs. As seen below in *Figure Nine,* Households that utilized a mason had construction times that were on average 2 months lower than those that self-constructed. Below in *Figure Nine* is a graph that shows the total time to construct a latrine as gathered through all surveys of households with a latrine. This data correlates with the low number of households that took two weeks or less to construct, and of the 10 that took two weeks or less, 8 of them utilized a mason.

This expedited construction time on part of the masons appears to contribute to the higher levels of mason-led construction in areas with by-laws. This is most likely a result of the household utilizing this trait of faster construction that the masons provide in order to avoid the punishments dealt by the sub-counties. Overall it appears that these by-laws strengthen the local private sector, as well as increase the quality and prevalence of improved pit latrines.

Figure Nine: Average Time to Construct a Latrine (In Weeks)

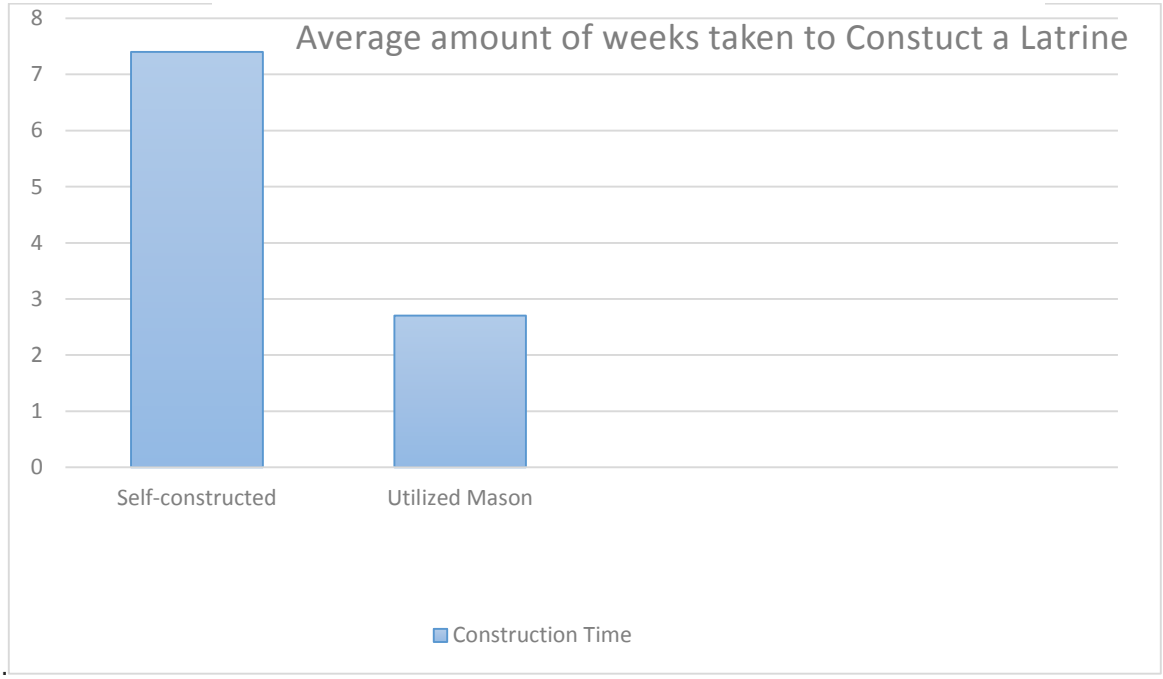
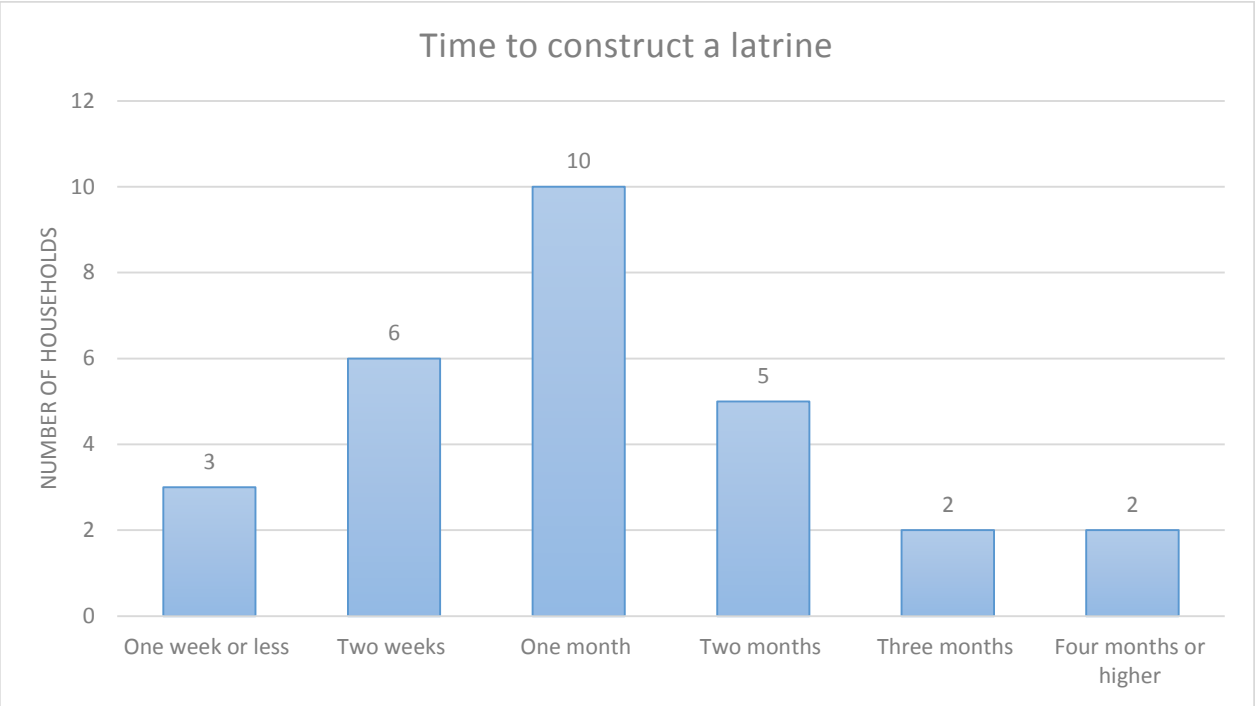


Figure Ten: Time Taken to Construct a Latrine (All households)

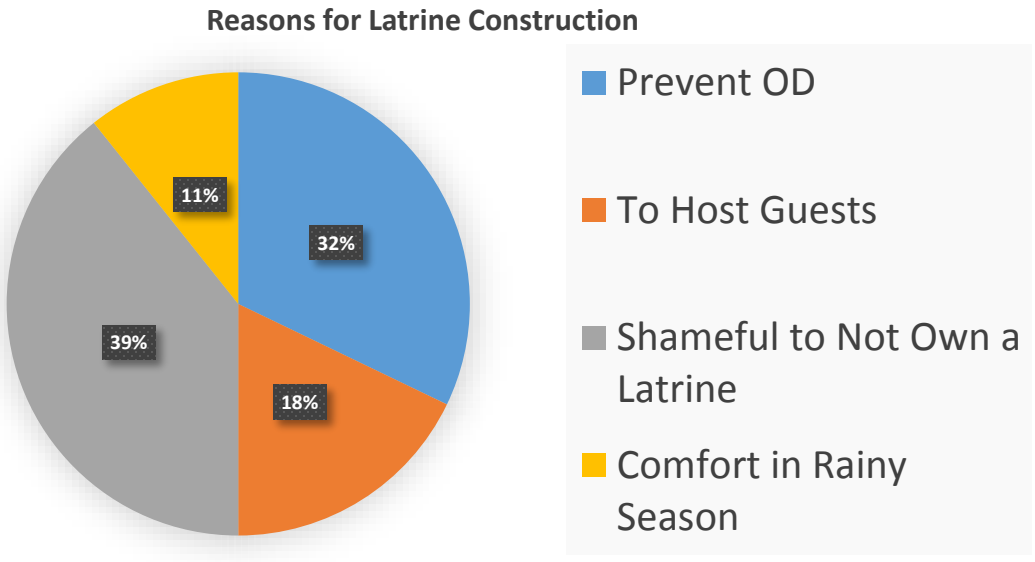


These various local governments, NGOs, and LCBs work in conjunction to build up the capacity of the local communities using these steps mentioned. In turn, the masons and other services that are present in the supply chain are better equipped to provide better services through training, which in turn can help bring about increased sanitation access. The cooperation between all of these different actors is pivotal in the region of Arua, as the state has not been successful, much less present in the region to provide sanitation delivery.

Sub-question Three: What factors influence residents to construct improved sanitation facilities?

The reasons for why households do, or do not, construct latrines is important for identifying and understanding the issues that bring about the lack or existence of a latrine. Discovering these reasons can also highlight how the availability, or lack, of sanitation services provided by the local private sector can impact the presence of a latrine. Through analyzing these responses, better solutions can be formulated to solve the gaps and issues present in the sanitation supply chain in Arua. The responses from both households that do and don't have latrines are displayed.

Figure Eleven: Stated Reasoning from Households on Latrine Construction



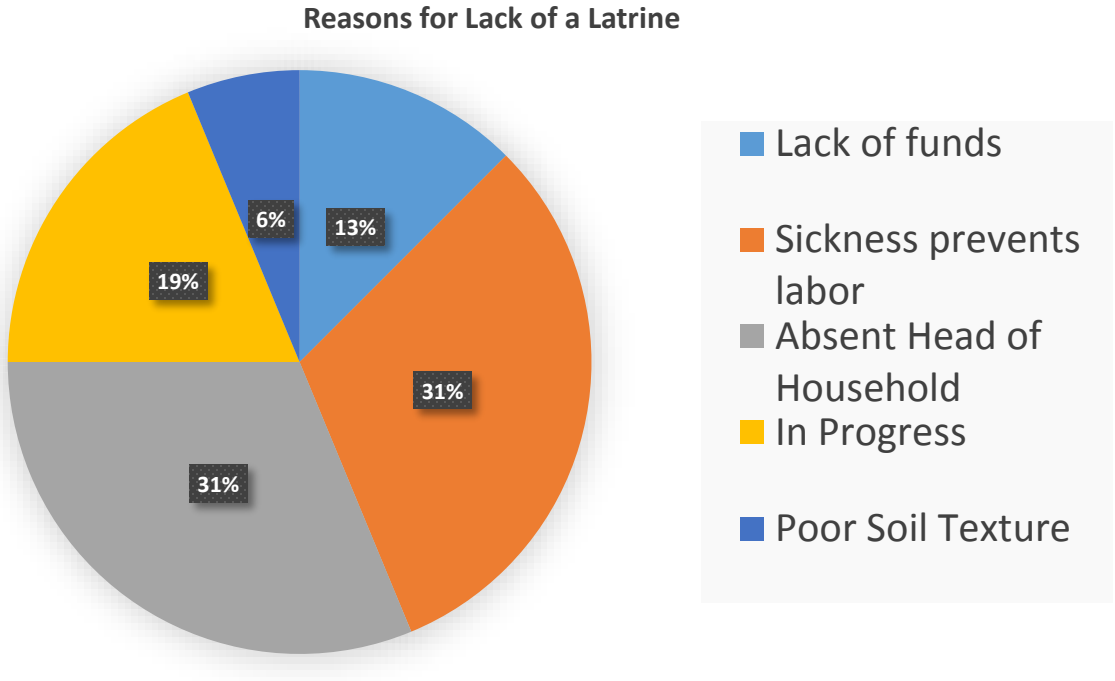


Figure Twelve: Stated Reasoning from Households on Why They Lack a Latrine

Reasons why households lacks a latrine

The explanations from the households that *did not* have a latrine show two interesting responses that make up the majority of the graph. The reasoning behind the "Absent Head of Household" was explained as being a result of the seasonality of work and travel that many heads of households (who are predominately male) undertake in both the rainy and dry seasons of the year. These heads of households are most often responsible for the construction of the latrine if they construct it themselves, or if they decide to hire a mason to construct, the heads are the ones who control the expenditures of the household, which in this case is the payment for the work of the mason.

The other prevalent response, "Sickness Prevents Labour, "is a bit more perplexing to discover the cause of. During the final meeting in country between the research team and the leaders of the various NGOs involved, namely SNV, the heads of the NGOs offered a few explanations for the high prevalence of this response. The first of which is that the respondent was getting sick from the practice of OD, from which disease vectors become prevalent in the area around the community. This cycle of sickness, expenditure for medicine to cure the sickness, and then falling ill again is seen in many areas that have pronounced OD behaviour. The cost of the medicine, particularly for households that have members in the extremes of age who are more prone to get sick, meaning over 60 and below 5 years of age, can cause a repeating drain on the household's resources. This lack of funds blocks the development of a latrine, and also fits into the 4th most cited cause of lacking a latrine. That of "Lack of Funds."

The second explanation for this response was explained by the leaders of the NGOs as a mere excuse for not constructing latrines, by which apathy is the true meaning of behind this response. This response may have some merit, as when asked "Why do you think people in the community don't have latrines" in Sections **G** and **K** of the household questionnaire, a majority (61%) stated that laziness or apathy was to blame, "Ignorance of Health or Latrine Construction" come in second with (24%), and the final 15% was made up of responses that matched the responses gave by those without a latrine. This attitude that those who don't construct latrines are apathetic or ignorant has a high chance of being culturally related to the denizens of Uganda, though as this study, understandably, received no responses from those lacking a latrine stating these factors, more research must be undertaken to conclusively state that that the response of "sickness preventing labour" as a lie/excuse.

The "lack of funds" was expected to be a higher percentage of the responses gathered prior to the field research undertaken by the research team. This lack of funds also contributes strongly to the self-construction of latrines, which as stated previously, can cause long construction times, as well as raise the rate of failure in the first year and a half of the latrine. Self-constructing a latrine is most often undertaken by the men in the family, particularly the head of households and close relations such as brothers and uncles. This trend towards the head self-constructing also fits into the response of how when the head is away from the household, latrines may simply not be built.

Those that responded with “In Progress” stated that they all were self-constructing the latrine. This trend highlights the issues that arise with self-construction and the amount of time spent in the construction process. The research team observed the latrines of the respondents who answered in this fashion to verify that this response was not a deflection or in other words, an untrue response. The latrines witness by the research team were in various stages of development, yet all had the pit well under progress. Most of these pits were reaching the final levels of construction, namely erecting the superstructure of bricks around the pit. The pit digging is the most time consumptive process in the construction of a latrine, thus this observation was not of much note to the team.

The final response “Poor Soil Texture” aligns with the aspect of digging the pit as well. The region of Arua has a multitude of soil types as one could expect from such a large area. This issue can be countered by construction techniques such as the circle pit design for sandy soils mentioned in sub-question 2. This technique is not well known, even to the NGOs and masons that operate in the region in an educational and practical context respectively. This type of pit design, as well as training of local masons, both have the potential to solve this issue with sandy soils, yet the other types of soil are a bit more difficult to prescribe a solution to.

Soils that are dense such as clay are common in certain areas of Arua region, this soil type causes issues with excavating pits on account of the physical properties inherent in them. Without the utilization of have digging equipment, which is extremely rare for pit construction, these soils are deemed to be too labour intensive for pit construction. New locations may or may not be available nearby, which can cause the household to either pick a new location near the homestead, or simply not construct. This is an issue that is hard to combat, yet thankfully it was only a small percentage of the responses gathered.

Reasons why households constructed a latrine

Again the responses for this section of the questionnaire have two responses that take up the percentage of the total. The predominate response by a small margin is that it is “Shameful to Not Own a Latrine.” This response was seen mostly in areas that had LCB interventions in place. As a part of the aforementioned techniques to trigger a village to construct latrines, shame plays a role the method that NGOs such as SNV use to foster interest in improving sanitation. This method of fostering interest and a desire to construct a latrine seems to leave a long lasting effect on those that are a part of the triggering session in the village. This response was also seen highly in areas with sanitation by-laws, likely a result of the reactions of neighbours witnessing fines and property repossession for not having a latrine. The experience of shame in regards to latrine construction is also tied, in both positive and negative traits, to the sharing of latrines in the community.

Sharing of latrines can be both a factor for constructing a latrine, as well as a factor for the household to not construct. On one hand, a household may decide to build a latrine as a result from disliking certain aspects of sharing such as waiting for the latrine to be unoccupied, or the nature of cleanliness of a shared latrine. While others continue to utilize a shared latrine on

account of being content with sharing, and viewing the practice in a neutral or positive light. The dynamics of sharing are very complex in the northern regions of Uganda, which has the highest rates of sharing in the county (UBOS, 2010). This high rate of sharing causes both of these issues of constructing or not constructing to be present, but this study found that it was not to quite as predominate for individuals to build a latrine from sharing as it was for those who share to not build one. This study found that 15 out of the 17 respondents that didn't have a latrine stated that they shared latrines in their community, while the other two respondents preferred not to answer.

The second highest reason that households constructed a latrine was "To Prevent OD." This response ties into the idea of shame mentioned above, as well as attitudes gained from local culture and triggering. The NGOs and local government in the region also monitor the areas that they operate in to find any evidence of OD in the village. These monitors will come in to declare a village "OD free" once adequate monitoring has been completed, and this state of "OD free" is often a cause for celebration for residents and NGO staff alike. These NGOs and community leaders often talk to the residents about the dangers of OD as well as the goal to be rated OD free. This is the most likely reason that the respondents state this response so often, as it is not only expected from their community (shame if you OD), it is also spoken to them at length by development staff and their leaders. This response creates a strong incentive for the development of sanitation, particularly by the local private sector as a result of increased demand cause by the shame and pressure of having a latrine. The villagers see the construction of a latrine as a necessity instead of a luxury, and the local market responds in kind in areas where there is a massive negative public perception of OD.

The last two reasons that take up the remaining share of the responses are tied more to the culture of simply having a latrine. The idea of hosting guests, notably family, and not having a latrine for them to use can cause embarrassment for the household. This response was seen evenly across all areas where the questionnaires were distributed, and marks a sort of inhent cultural attitude towards hosting guests. The rainy season is the time where individuals OD the most, as the grasses and vegetation of the area grow thick and conceal the individual. Having a latrine that shelters from the rain and the comparatively more difficult topography that occurs in the rainy season, such as deep mud, to reach an OD spot spurs this reason for construction.

Over all, the reasoning for the construction of latrines revolve around community and NGO pressure, most importantly to avoid shame from these respective entities. The local private sector plays a role in the development of the latrines as a result of these factors, while self-construction can also be seen to emerge from the attitudes and consequences of not having a latrine listed above. Understanding these factors especially the issues that surround those that don't have a latrine, are vital in formulating solutions to bring about increased improved sanitation coverage. Training of masons, creating attitude change through triggering and community pressure, as well as having a high prevalence of masons available to combat a the issues of a household not being able to work on account of sickness, can all bring about positive change in sanitation coverage. Of course having the funds to pay for masons, as well as a willingness to hire masons, should they be available, is very import to take into account if these strategies have any hope of being successful. This question of whether individuals in the villages

are willing to pay for sanitation products and services is the subject of the following sub-question.

Sub-question Four: To what extent is there a willingness to pay for these sanitation services and products?

Whether or not rural households in the region are willing to pay from the construction of a latrine, or if they are willing to pay for a higher quality latrine is what much of the sanitation supply chain relies on. Simple demand and supply.

Both questionnaires for the households had questions that are intended to gain insight into if, and how much, the respondent is willing to pay for a sanitation service. These services were divided much in that same way as the questionnaire for service providers was. This field as seen in Section **I** and **L,** specifically target: Masons, Slab, Pit, and for concrete if they were aware of a source.

The section that was a part of the households with a latrine form yielded some interesting results that show the potential of the service delivery by the local private sector. Out of the 28 "households with a latrine" questionnaires, 26 of the respondents stated that they would be willing to pay a sum of money for the construction of various aspects of a new latrine, while the other 2 in this category had no desire but to self-construct their latrine in the future. This section will be broken down by the various services as well as how much the household paid for a service if used in the past.

Willingness to pay for households with a latrine

Slab

Out of the 26 households in this category, 11 of the respondents stated the most they would be willing to pay of a slab would be. 10,000-25,000 UGX ($2.72-$6.80). This response is interpreted as the household wanting another traditional slab made out of wood, as the lowest price threshold observed for a concrete slab was 30,000 UGX ($9.52). These respondents have a willingness to pay for a mason to construct a slab, yet they don't quite meet the threshold for the purchase of more durable materials, yet a traditional slab for 25,000 UGX would be of a more quality build. None of the respondents quoted a price on what they would pay for concrete, as they did not have substantial familiarity with the product or pricing.

6 out of 26 of the respondents stated that they would pay 30,000-50,000 UGX ($9.52-$13.60) for a slab. This price covers the prices of the smallest to the medium sized concrete slabs that are made in Arua. Making the slab on site would lower the price if available, perhaps even the lower prices quoted in the 10,000-25,000UGX range could afford if the concrete slab was made

on site. The centralization issues are most important in both of these price quotes, as the demand is there, it is only the supply that breaks this supply chain link. 13 of the 26 respondents in this category constructed their slab themselves, yet of these 10 had their previous latrine fail due to the slab collapsing, highlighting the issues associated with self-construction. On the other hand the other 13 of the 26 had their slabs created by masons, and only 3 of them had their latrine fail due to the slab collapsing. The lack of masons in the rural areas appears to be a large issue if such a demand is there and is not met.

Pit

Out of the 26 respondents the average for the maximum price they would spend on a pit was around 72,000 UGX ($19.58). The pit is often the most expensive aspect of a latrine to construct and the prices quoted for this service were much higher than expect. A few of the respondents quoted prices as low as 15,000 UGX ($4.82), while 4 of the respondents quoted prices in the 180,000-250,000 UGX ($48.96-68.00) range. The potential for masons or other individuals to insert themselves into this occupation is massive, and yet this study found that the average pit depth in the region of Arua was 12.3 feet, with an average cost of 10,000 UGX ($2.72) per square foot. This average pit size may seem deep, but the high amount of sharing that is prominent in the region, as well as constant roof failures allowing water in, are directly attributable to the high rate of latrine failure being caused by the pit filling up quickly. These failed pits need to be replaced quickly, yet due to the lack of labour that is necessary in creating a deep and strong pit, many of the households that had a latrine fail due to filling up take many months to replace the latrine, which gives rise to other issues such as OD and more latrine sharing. A dedicated set of tradesmen that specialized in pit digging has the potential to not only fill a need in the market that pays very well compared to the average wage in the area, but these specialized pit diggers could also alleviate the rate of latrines failing from filling up, and also bring about longer lasting latrines.

Mason

The willingness to pay for masons to construct the superstructure around the latrines were not as high as predicated. 22 out of the 26 respondents stated that they would pay 5,000-15,000 UGX ($2.72-4.82) for the creation of the superstructure around the latrine. One respondent stated that they would pay 30,000 UGX ($9.52) for the walls and roof, yet the other 3 stated that they would self-construct the walls and roof on their own once again. Even the lowest price listed here is slightly higher than what masons usually charge for creating the superstructure, yet the demand for this aspect of the construction isn't enough to change the frequency of masons to be involved solely in superstructure fabrication.

The willingness to pay for households without a latrine

10 out of the 17 respondents of stated that they were willing pay for sanitation construction services. This demographic was not as willing to pay for services as a whole, and if they were, the prices that they quoted were far below what those that currently had a latrine would pay. 9 out of the 17 stated that they had a latrine in the past, yet the remaining 8 had no experience in building or buying the various services that make up the aspects of a latrine. This lack of knowledge on the pricing of the services is quite clear from the data shown below.

Pit

8 out of the 10 respondents stated that they would pay at most 15,000 UGX for the pit, while the remaining two stated that they would pay 20,000 and 25,000 UGX. These prices fit in with the responses gathered on the subject of why the household doesn't have a latrine in sub-question 3.

Slab

Only 3 of the 17 stated that would pay for a slab, the remaining stated that they would self-construct a slab should they build a latrine. The prices for the slab mirrored the prices quoted for the pit, and no respondent answered about 15,000 UGX.

Mason

5 out of the 17 respondents stated that they would pay 10,000 UGX for the superstructure, while the other 12 stated that they would self-construct the walls. This service once again does not have a great demand.

Overall, the stark differences between the two household types creates many opportunities for the local private sector when dealing with households that had experience in constructing and purchasing sanitation services, yet not many opportunities exist for the local private sector in regards to households without a latrine. The households without a latrine appear to quote low prices from simply not knowing what the prices are of the services combined with a lack of funds. The households that lack a latrine were often from the areas without LCB interventions, so future interventions from the LCBs and NGOs that operate in the area do have the potential to bring about increased awareness of the service pricing thereby increasing demand that the service providers felt worthwhile to pursue.

Sub-question Five: What are the levels of consumer satisfaction with current sanitation services and products?

Both household questionnaires detail the levels of satisfaction that the residents of Arua region felt towards their latrine and the availability of sanitation services and products, while the Sato Pan Consumer Satisfaction survey looks into how the consumers of the Sato Pan view the product, and what aspects of the product they like or dislike. Though these questionnaires,

what services and products are desired along with overall satisfaction rates can be observed and measured.

Households with a latrine satisfaction

Satisfaction with current latrine

Out of the 27 households that currently had a latrine, these were the most common answers to question. The respondents often stated multiple responses, which are counted here.

"What do you like best about your latrine?"

Its affordable (17/27)

Good for guests (13/27)

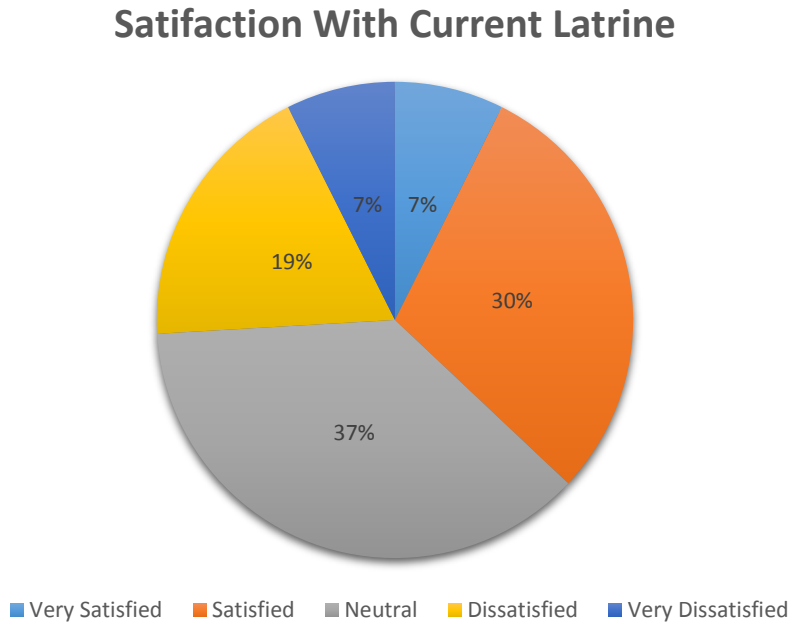
Easy to construct (8/27)

Comfortable for family (11/27)

Easy to use (6/27)

Question H4 in the Household Questionnaire asks the respondent how satisfied they are with their current latrine, and the answers are a sign that the latrine owners want further improved latrines, on top of the willingness to pay, the availability of the services that can offer better latrine construction appears to be the main blockage that exists in the way of higher satisfaction

Figure Thirteen: Household Levels of Satisfaction with Current Latrine



The attitudes toward the latrine being affordable are very common in this question, as the majority of these respondents either paid for only one aspect of the latrine, most often the pit and/or slab, or constructed the latrine themselves. The self-construction of the super structure that most of these households undertook causes apparent issues in the next section, as the maintenance of the walls and roof are the two highest aspects that these households are displeased with. Combine this displeasure with the willingness to pay mentioned in sub-question four, and a strong case for the services of the local private sector in the installation or maintenance of the superstructure becomes apparent.

These households also were then asked

"What would you improve about your latrine?"

These households responded as recorded below. The respondents often stated multiple responses, which are counted here.

Plaster/smear the brick walls (22/27)

Replace roof (20/27)

Fix rat holes (8/27)

Make a hole cover for the slab (11/27)

The households were then asked

"What do you not like about your latrine?"

This question highlights a lot of the issues that the latrine owners run into, and can offer good methods for the local private sector to fill the desires and demand of the latrine owners. The respondents often stated multiple responses, which are counted here

Roof needs to be replaced (20/27)

Rats can enter (13/27)

Its temporary (8/27)

Hard to clean (7/27)

Slab is failing (3/27)

No soap available (2/27)

Smells (16/27)

Flies (23/27)

From these two questions it is observable that many issues can cause displeasure with a latrine, yet in the first question, the responses were very focused on the maintenance of the structure. The materials that the latrines are made out of are often in need of maintenance due to their non-durable nature. Termites can eat the grass roof and logs in the slab, the mud smear/plaster on the wall washes off with rain, rats can cause pit collapse etc. These are issues that can be solved by either utilizing strong materials for the construction of the latrine, or by maintaining the latrine overtime, either by the homeowner themselves or a hired hand.

Sato Pan consumer satisfaction survey.

This survey was created by the NGO Water for People based in Kampala, and the aim of the survey is to gain insight into the how the end consumer of the Sato views the product. This study intended to complete 60 of these surveys, yet the issues of installation mentioned in sub-question one caused many difficulties in reaching this intended number. Yet, the research team still managed to collect 33 of these surveys, and the levels of consumer satisfaction with the product are detailed below.

The Sato Pan surveys exposed the massive levels of consumer satisfaction in the product. The survey details various aspects about the product that the respondents are probed to answer often through a choice of answers, or through an “Other” response slot where answers could be recorded if the response didn’t fit the options available. Many of the questions on this survey are intended for Water for People’s own demographic data that focuses on the method that the consumer acquired the product, as well as details surrounding the type of sanitation facility owned and the pricing of the product.

The Sato Pan was designed by American Standard Ltd. to be very affordable for households in the developing world. The responses gathered from this study shows that an aver price of 12,000 UGX ($3.02) was paid for the product across all surveyed consumers. Prices as high as 18,000 UGX ($4.89) were paid, and prices as low as 9,000 UGX were also observed. In the case of the product costing 15,000 UGX or more, installation of the product was often included. The installation of 5,000 UGX was observed to be the average rate that masons would charge for the installation. Below in *Figure Fourteen* is a chart that highlights the responses that that were given to the question of “Are you satisfied with the Sato Pan?”

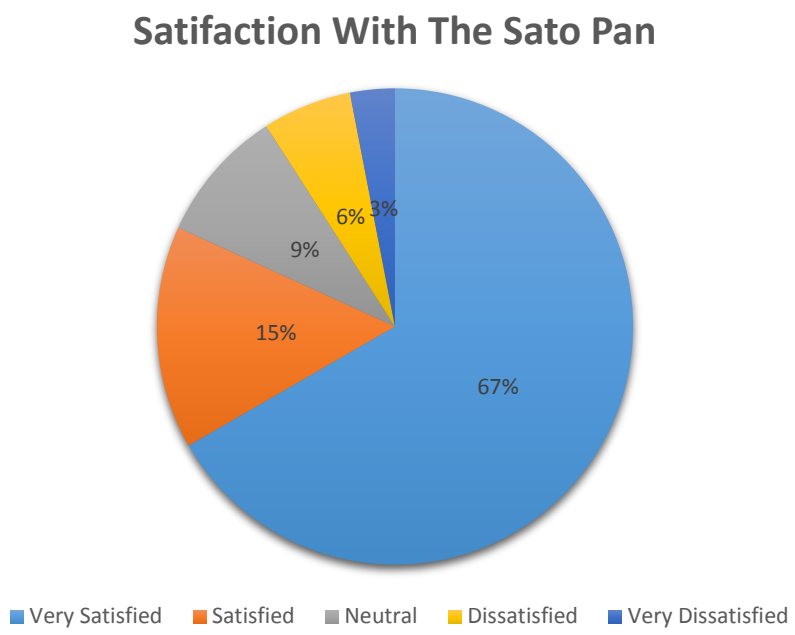


Figure Fourteen: Sato Pan Satisfaction Levels

The distribution towards the "very satisfied" was great news for both the potential for the product to further permeate into the rural supply chain, as well as for Water for People and SNV who are very involved and interested in creating a more widespread distribution of the product. After this question, the survey probed into the reasons that the respondents were so satisfied, or dissatisfied.

Figure Fifteen details the responses of what feature of the Sato Pan they enjoyed the most. The high rates of "No Flies" and "No Smell" were a common response to the query. There were only 5 responses that were in the "other" category, and these responses detailed that the pit latrine was safer in regards to closing the pit so that small animals or children could not fall in the hole. The high amount of "Far price" responses is a good sign that the product can be marketed across a wide range of rural areas, as the various areas surveyed in this sample where of varying socio-economic discrepancies and location, which lends toward the idea that a majority of the rural populous would consume the product, if available.

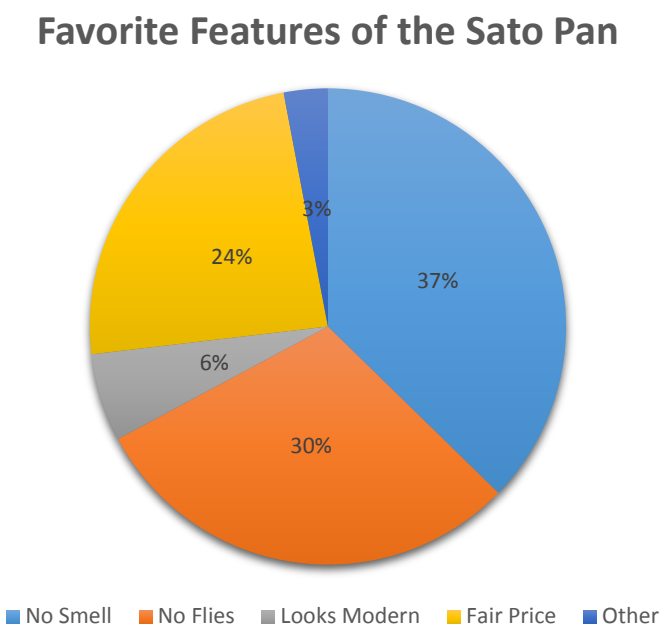


Figure Fifteen: Consumer's Favorite Features of the Sato Pan

The responses as to why the respondents were dissatisfied is also interesting to examine, though these responses where far less diverse. 20 out of the 33 respondents stated that they didn't have any complaints about the product. Out of these 13 that had complaints, 8 of them were individuals that hadn't yet installed the Sato Pan yet. These respondents stated that the installation was their main complaint, with the availability of masons that could install it being the main issue in this response. The reaming 5 respondents that had installed the Sato Pan stated that they had issues with the amount of water it took to was the waste down the hole.

The final most interesting field that was included in the survey was a measure of how satisfied the household was in regards to the installation procedure. The responses gathered from this question were slightly leaning to the negative stance of the responses. *Figure Sixteen* below shows this distribution.

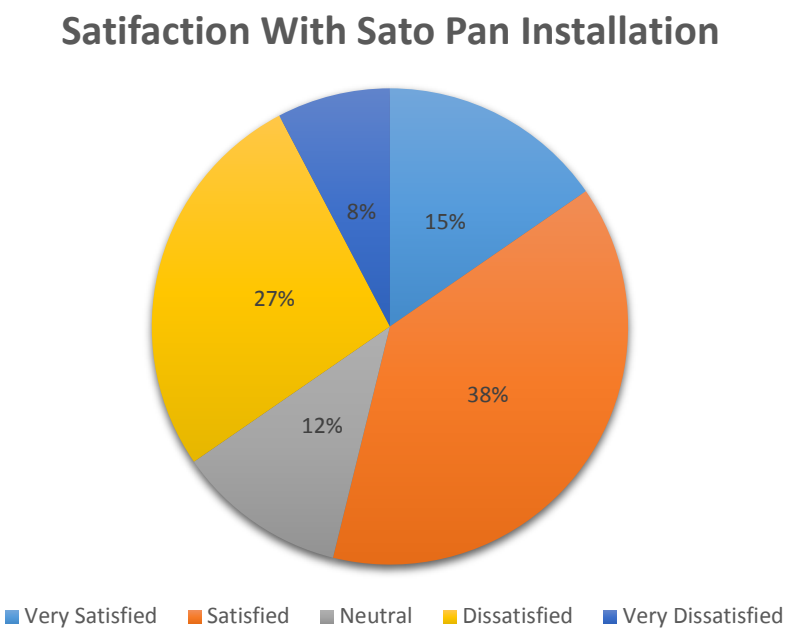


Figure Sixteen: Levels of Satisfaction with the Installation of their Sato

The "dissatisfied" responses stemmed from the amount of time that the service provider took to reach their home stead, as well as being charged higher than 5,000 UGX, which is what the NGOs and LCBs tell the masons they train to install for. Over all the respondents had mostly a neutral to positive experience with the installation process, which is also positive to the future of the product penetrating further into the region, as positive experiences are more likely to proliferate any new product on a market.

Overall the levels of satisfaction with Sato Pan are very positive, and the demand seen for the product in the areas surveyed was high. The product does suffer from a lack of awareness from a majority of the residents of Arua district, and many LCBs and NGOs are just beginning to adopt awareness strategies for the product alongside the standard sanitation development activities that they are involved in. This product has a massive potential to be a product not only useful for increasing sanitation health and the spread of improved sanitation facilities, but also as a mainsail product for the local private sector to invest in.

Conclusion

This section details a summary of the results of each sub-question so that a cohesive answer to the main research question shall be made clear. To reiterate this main research question is:

How can the local private sector enhance the sanitation supply chains of rural Arua, Uganda so that increased access to improved sanitation services, facilities, and products could be achieved?

Sub-question One: What sanitation services and products are currently available, and what issues do the service providers face in delivering their products?

This research found that masons are in short supply in the district of Arua, and these masons are often not trained in advanced construction techniques that can bring about suitable sanitation facilities. More training for these masons is seen as a viable solution to not only increasing the numbers of active masons, but also to improve the construction quality of their latrines. Latrines that were constructed by masons also failed less due to collapse, which was the second highest cause of latrine failure witnessed. The importance of the presence of masons cannot be understated, and the proliferation of these masons can ensure that many more households gain access to quality latrines.

Aggregate and concrete producers face issues of centralization in the urban areas of the district, and there is not very much willingness to branch out of the urban areas for these service providers. The creation of a dissemination scheme such as the utilizing out bound trucks to deliver dry concrete to rural trading centers along main roads can help spread the availability of concrete to rural areas. This solution is also dependent on the above mentioned solution of training masons. Training the masons in rural areas in the way of making in-place slabs from concrete can create a demand for more durable slabs from the households, as well as secure a new source of work and income for the masons.

The septic tank emptiers faced issues with dumping the waste, as well as the high costs of owning and operating the business. Tax breaks for the sale and/or importation of the trucks has the potential to lower the high cost of purchasing the trucks which in turn creates a more attractive investment for the private sector. Having more trucks in an area can in turn create more demand for septic tanks, leading to a more sustainable sanitation sector in the district. Securing more dump sites as well as lowering the price of the trucks are potential solutions to increasing the presence of these trucks in the district.

The Sato Pan faces issues of being an unknown product in the county. Limited advertisement and even more limited availability has caused issues of local shops stocking them, and local rural households buying them. Increasing the number of private shops that sell the Sato Pan is expected to bring about more purchases and installation than if the dissemination is left purely to the LCBs and NGOs in the region. Advertisements and the training of masons and households in the installation of the product are also necessary in the proper utilization and adoption of the product.

Overall, I was surprised with the limited availability of sanitation products in the district, and during the formation of this research I expected there to be more choices and more availability of many products across the rural landscape, particularly concrete. The reality on the ground is that the centralization and lack of knowledge about these products has created a system where latrines are made from sub-par materials which cause them to collapse. The lack of knowledge and availability of the products and services creates a loop where a household goes through latrine after latrine with no real improvement in the design or materials, causing a state of unsustainable sanitation. There is massive opportunities to expand the local private sector in this regard, and further influence from LCBs and NGOs will likely create more accessible opportunities for the local private sector to take advantage of.

Sub-question Two: To what capacity do local, regional, and national actors interact to provide sanitation products and services?

The cooperation with local NGOs and LCBs are pivotal in strengthening the local private sector through demand creation (triggering) as well as providing the tools necessary to allow the local private sector to flourish through methods such as the training of masons, dissemination of Sato pan stock to interested shops, as well as creating future opportunities such as concrete decentralization.

The current state of actor cooperation is low, particularly in regards to the communication and by-laws set between each sub-country. These various by-laws and cooperation with the LCBs and NGOs in the region has resulted in massive disparities between each of these sub-counties. Monitoring of the progress in each sub-county also varies which causes certain villages and households to not construct latrines, or simply begin construction while the monitors are there and then cease when they are gone. Enforcing stronger sanitation by-laws is a good solution in increasing the awareness and demand for sanitation products and services, yet these by-laws are only useful if monitoring teams from different NGOs and LCBs participate in conjunction with the sub-county so that the accountably of the sub-county and households are ensured.

The state is hardly directly involved in the provision of sanitation and instead delegates these duties to the international NGOs in region as mentioned above. National level NGOs are crucial in triggering the formation of the supply chain, namely demand for sanitation facilities. Having the state provide subsidies for the creation of rural sanitation facilities would be a great start in furthering the development of the sanitation sector in region such as Arua, yet the political gridlock on funding and allocation has created limited hope in this regard.

The state of cooperation was a bit surprising to me upon learning more about the local realities in Arua. The differing by-laws across the district is something that stood out to me as a major issue right from the start. As the sub-counties enjoy a sort of autonomy from the district government, district wide by-laws have not been emplaced or even developed in the first place. This would be a good step in securing more sanitation facilities, and in turn strengthening the supply chain through increased demand around the district. The sub-counties with by-laws were seen to have much higher rates of latrine coverage that the other sub-counties, and the creation, but more importantly, the proper implementation and monitoring of the by-law stipulations can bring about a wider distribution of improved sanitation.

Sub-question Three: What factors influence residents to construct improved sanitation facilities?

This study found that shame of OD and not owning a latrine was a powerful force in the creation of sanitation facilities, followed by convenience and comfort. This idea of shame in regards to not owning a latrine is seen to stem from the triggering methods of the NGOs as well as from familial traditions in some cases. Shame also has a part in the top reason “to prevent OD” in that OD is seen as a dirty and shameful act in many communities. The efforts by NGOs and LCBs that teach the dangers of OD were seen plainly in this response, as the majority of those that responded in this way were in areas that had LCB intervention.

The respondents who leaned toward convenience stated comfort in the rains, as well as the ability to host guests as the main reasons for the construction of a latrine. One of the interesting things that showed up in this section of the results was the responses from those who did not have a latrine.

Those who did not currently have a latrine stated sickness and lack of a household head as the main two reasons for not having a latrine. The sickness response is thought to be a sidestep or an excuse by the LCBs and NGOs that operate in the region, yet the reality of perpetual sickness caused by poor sanitation practices is most certainly a reality in the region. These issues are hard to solve as the reality of the head of household migrating for seasonal work is common in many villages. These responses show that LCB interventions are successful in creating demand for latrines in the region, and the local private sector still has potential to meet this demand, especially if they are pointed to areas that have recently been triggered.

The factors that caused households to construct sanitation facilities were very interesting to me once the analysis of the data was done. I expected to see more answers that pertained to "the government made me do it," yet some of these responses may be masked by the response "to prevent OD." Regardless, the high percentage of respondents that were knowledgeable about the dangers of OD was reassuring to see, as the consequences for continued OD can be disastrous to a household, particularly the youngest members.

Sub-question Four: To what extent is there a willingness to pay for these sanitation services and products?

This study found that a high willingness to pay existed for sanitation products and services, particularly from those who already had a latrine. The prices quoted by the respondents were often higher than the price of the various services and products inquired about, showing that a lack of these products and services was what often prevented the households from using higher quality materials or hiring a service instead of self-constructing.

The households that did not have a latrine stated a lower willingness to pay which is not quite surprising, given that many of these households have not owned a latrine before. This is a bit concerning though, as this low willingness to pay doesn't create much incentive for service providers to cover their area. The majority of these respondents stated that they would self-construct their latrines, and only a small fraction stated that they would pay for a mason. Awareness of construction techniques for these households is a good solution that would help create stronger latrines as they predominately wish to self-construct, as the possibility of them paying for construction services is quite limited.

This willingness to pay can also be a signal that if a PPP was set up with a strong private interest in the region, many more people may be willing to pay for the provision of sanitation service than previously thought. PPPs are often most effective in areas with a high willingness to pay,

and this discovery of a strong willingness should be an important signal to larger private interests that wish to invest in the region.

Sub-question Five: What are the levels of consumer satisfaction with current sanitation services and products?

Overall most of the households that had a latrine stated that they were moderately satisfied with their latrine, yet all of them had some type of response in regards to improving their latrine. The majority of these desired improvements consisted of repairing the walls and roof of the latrine. A few of the respondents expressed interest in replacing their roof with a metal sheet, or purchasing a concrete slab. In general there are opportunities for the local private sector to provide these materials and fill in the gaps that exist in the provision of products and services in these areas which are sought after by these households that wish to improve their latrines.

The Sato Pan was used as an example of a sanitation product in the supply chain in this research. The Sato Pan had massive amounts of satisfaction in the household surveyed, yet issues with the installation of the product were also prevalent. This study found that Sato Pans sold by the local private sector had much high rates of utilization and installation than those provided by LCBs and NGOs. This result was surprising, yet seems to stem from the incentives that the shops have in ensuring satisfaction with the product, where the NGOs and LCBs were mostly concerned with distributing and raising awareness of the product. The Sato Pan showed that a sanitation product in the region has the potential to be adopted and well received if distributed through the right channels, in this case through the local private sector.

Ending remarks

Overall, this study found that the region of Arua has a large potential for the local private sector to expand, which in turn has been observed in this study to bring about stronger, safer, and longer lasting latrines. The concrete slabs, Sato Pans, and improved pit designs comprise these benefits, and the local private sector was observed to offer these products in a more effect and widespread manor than the state or local governments.

There is also a strong willingness to pay for construction services and products, yet the majority of the respondents didn't have a many services around their location and thus, self-construct. Self-constructed latrines were found to be more prone to failure than latrines that were created by masons. This lack of service providers such as masons can create a cycle of unsustainable latrine coverage, and in turn resulting in a stagnation of increase latrine coverage. This demand for stronger materials and construction services is not yet met in many of these communities in Arua district. This lack of products and services is a key issue that can be resolved to strengthen the supply chain in the region. The training of local masons, as well as the

The cooperation with local NGOs and LCBs are pivotal in strengthening the local private sector through demand creation (triggering) as well as providing the tools necessary to allow the local

private sector to flourish through methods such as the training of masons, dissemination of Sato pan stock to interested shops, as well as creating future opportunities such as concrete decentralization.

The state of sanitation is slowly improving the region, due to the efforts of many NGOs and LCBs that operate there. Yet, in a region of such grand size and such variability in geography, by-laws, local leadership, and sanitation awareness, the need for a new method of sanitation delivery is necessary. The sanitation supply chain in this region is fragmented and weak from low service availability and knowledge of construction practices, which in turn has created little to no product or service delivery to the communities that need it the most. The demand for these sanitation products and services are low as a result of the limited awareness on alternative products that can help create stronger and more sustainable sanitation solutions.

Strengthening the sanitation supply chain by building the capacity of the local private sector has the potential to create a new reality of sanitation delivery in a region where the state has all but left them to their own devices. Utilizing these NGOs and LCBs to create sanitation demand while also providing the resources and knowledge necessary to sanitation service providers can close many of the broken links that are present in the current sanitation supply chain in the region, resulting in a more hopeful future for the development of improved sanitation access.

It is my opinion that focusing on furthering the reach of the local private sector is the premier way to bring about increased access to improved sanitation in the district of Arua. Unless there is a massive government policy of intervention in the WASH sector of the rural areas of the county, the local private sector is the most solid choice in the delivery and dissemination of sanitation products and services. When working in conjunction with LCBs and NGOs, the creation of demand can be made, and the demand can be made if these organizations train and point the local private sector in the right direction. I foresee a Uganda where the local private sector flourishes and in turn, the residents of the rural areas of the country can enjoy access to safe and improved sanitation.

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Annex

Annex One: Household Questionnaire

Information Panel (A)	
A1. Household ID: #	**A2. Date:**
A3. Interviewer:	**A4. Research observer:**
A5. Name District:	**A6. Name Sub-county:**
A7. Name Parish:	**A8. Name Village:**

Demographics (B)	
B1.Gender of respondent:	**B2. Gender of household head:**
B3. Occupation	**B4. Age of Respondent**
B5: Language of household	**B6. Religion**
B7. Education Level of respondent	**B8.Tribe**

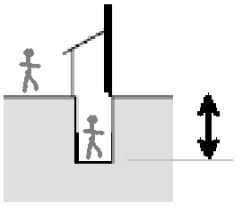
House Survey (C)	
C1. Material of roof:	**C2. Material of base/floor:**
C3. Material of walls:	

Latrine Ownership (D)
D1. Does your household own a latrine? *If YES go to Form 2 , if NO go to form 4*
D2: What type do they own?

Form 2: With latrine. (Latrine ownership History)			
G1. What made you decide to build a latrine?			
G2. How long have you had this latrine?			
G3. Did you own another latrine before this?	Yes	No	
G4. If YES, what happened to it?			
G5. Do people in your community share latrines?	Yes	No	
G6. Do you share your latrine? If so with who?	Family	Neighbors	Other:
G7. What makes people who own a latrine different than those who don't?			
G8. Why do you think people in the community don't have latrines?			

Form 2b (Latrine Details and Satisfaction) {H}		
H1. What are the things you like best about your latrine?		
H2. What do you not like about your latrine?		
H3. If you could make some improvements to your latrine, what type of improvements would you make?		
H4. How satisfied are you with your current latrine?	• Very satisfied • Satisfied • Neutral • Dissatisfied • Very dissatisfied	
H5. Has your latrine ever filled up?	Yes	No
H6. From who did you get the ideas for constructing this type of latrine?		
H7. Who all decided on the construction in your household?		

Form 2c (Service Provision Awareness and Cost of Services) {I}		
I1. Did you construct the latrine yourself?	Yes	No *Go to form 3*

I2. How was the pit dug for the latrine?	Community/family	Pit digger	Other:
I3. If dug by a pit digger, how far away is the pit digger (in km)	Location		
I4. How did you find this service?			
I5. Do you know how deep the pit is? 	Yes (how deep)	No/Unsure (refer to the diagram)	
I6. Have any pits in the community collapsed recently (1 years)	Yes	No	
I7. If so, what did the household do about it?			
I8. Where and how did you find the mason to create the slab?	Mason/Slab provider:	Way of contact:	
I9. How much did you pay for the latrine slab?	Slab:		
I10: How much did you pay for the pit	Pit	Self-dug	

I11. Where are these services located? *Distance away in KM*	Pit digger:		Mason:	Concrete:
I12. What is the furthest you would travel to access these services? (time, KM, village name)	Pit digger:		Mason:	Concrete:
I13. How much did you pay for each of these services?	Slab:	Pit:	Mason:	Concrete:
I14. What is the maximum you would pay for these services?	Slab:	Pit:	Mason:	Concrete:
I15. How long did the latrine take to construct from start to finish?				
I16. How satisfied are you with the service you received to construct your latrine?	• Very satisfied • Satisfied • Neutral • Dissatisfied • Very dissatisfied			
I17. Do you know about Sato Pans?	Yes		No	
I18. Do you have one? *Go to survey if so*	Yes		No	

Form 3 (Self Construction) {J}			
J1. Who assisted in the construction of the latrine?	Family	Community	self
J2. How deep did you dig the pit?			

J3. How long did it take to dig the pit?				
J4. Where did you get the materials needed for the slab? What type of material is it?				
J5. How did you transport the materials to the latrine site?	Bike	Boda	Car	By foot:

- **Form 4: No Latrine (Attitudes Towards Latrine Construction, Ownership History, Preferences) {K}**

K1.Have you considered paying for the construction of a latrine for your household?	Yes	No
K2. Have you considered building one yourself?	Yes	No
K3. What prevents you from building one if so?		
K4. Are you aware of Sato pans?	Yes	No
K5. Do you own one presently, or in the past? *If so go to Sato questioner*	Past	Present
K6. Have you owned a latrine before?	Yes	No
K7. If so what happened to it?		
K8. Do you share latrines in your community?	Yes	No
K9. What makes people who own a latrine different than those who don't?		
K10. Why do you think people in the community don't have latrines?		

Form 4b (Service Provision Awareness)				
L1. Do you know the services (masons slab, pit) available here?	Yes	No	*Which ones are they aware of?*	
L2. Do you experience any problems with the availability of services?	Yes (*if so probe with q's such as if they would like it to change and be more available*) Which ones?		No	
L3. How satisfied are you with the current availability of services here?	• Very satisfied • Satisfied • Neutral • Dissatisfied • Very dissatisfied			
L4. Where are these services located? Distance in KM	Slab:	Mason:	Pit digger:	Concrete:
L5. What is the max distance (in KM) you would travel to access these services?	Slab:	Mason:	Pit Digger:	Concrete:

L6. Are these services affordable to you? *If respondent knows prices*	Yes	No		
L7. Do you think these services would be affordable to you?	Yes	No		
L8. What would be the maximum price you would pay?	Slab	Mason	Pit digger	Concrete
L9. If you would make a latrine yourself, who would assist in the construction? *(Family, community)*				
L10. What do you think would be the most difficult aspect of the construction?				
L11. If you were to build a latrine now what type would you build?	Type:			

Annex Two: Service Provider Questionnaire

A1: Age of respondent:

A2: Location of Interview

- A3: Sub county:
- A4: Parish:
- A5: Village:

A6: Date of Interview:

A7: Name of Interviewer:

B1: Have you considered making slabs?	
B2: If not, what prevents you from making slabs?	
B3: How long have you been working in this service?	

B4: Where did you learn this trade from?	
B5: How far would you travel to find a new customer?	
B6: What is the average price you charge for your service?	
B7: How do you transport the materials to the work site?	
B8: Where do you get your materials from?	
B9: Do you have much competition for your service in the area?	

B10: Did you attend a trade school?	
B11: How do you find new customers?	
B12: Do you have many people you don't know approach you for service?	
B13: How many jobs have you completed in the last 2 months?	
B14: Do you feel that you could do anything to reach more customers?	
B15: How has your rate of being hired for service changed in the past 2 years? (If applicable)	

B16: How many people work with you on these jobs?	

Annex Three: Septic Pit Emptier Survey

A1. Age of respondent:

A2. Location of Interview

- A3. Sub county:
- A4. Parish:
- A5. Village:

A6. Date of Interview:

A7. Name of Interviewer:

A8. Company name

B1. When was this company founded?	
B2. How many vehicles do you have for empting latrines?	
B3. What sub counties do you operate in?	

B4 .How long have you been working in this service?	
B5. Where did you learn this trade from?	
B6. How far would you travel to find a new customer?	
B7. What is the average price you charge for your service?	Hourly: Per unit of waste removed?
B8. Where do you dump the waste that you collect?	
B9. How many jobs do you complete a week?	

B10. Do you have much competition for your service in the area?	
B11. If so then who?	
B12. Who is the biggest waste emptying service in this District?	
B13. What types of issues do you encounter in the field? Mechanical? Road conditions?	
B14. How does the demand for your service change in Rainy season?	
B15. Which season creates the most demand?	

B16. Do you empty both septic and pit latrines?	
B17. If so, which is more in demand?	
B18. Did you attend a trade school?	
B19. How do you find new customers?	
B20. Do you have many people you don't know approach you for service?	
B21. How many jobs have you completed in the last 2 months?	

B22. Do you feel that you could do anything to reach more customers?	
B23. How has your rate of being hired for service changed in the past 2 years? (If applicable)	
B24. How many people work with you on these jobs?	

Annex Four: Sato Pan Consumer Satisfaction Survey

Sanitation Customer Satisfaction Interview

Date of Interview: _____Name of Household: _____

GPS Coordinates: _____

Location/ Village: _____ Interviewer/s: _____

Sex: Male____ Female___

Age group ☐ 18-25 ☐ 26-32 ☐ 33-40 ☐ 41-46 ☐ 46 and above

Landlord/Tenant (Please Circle)

Do you own this land? YES/NO (Please Circle)

B. Service Provider

1. How did you know about the Sato pans (Entrepreneur)?

☐ ☐

☐ A Friend ☐ Hard ware shop ☐ Radio advert ☐ Leaflets/ Poster VHT NGO ☐
Other: Specify_____

2. Name of Sanitation Service Provider: _____

3. Location of provider: _____

---

4. How did you contact the supplier/ local masons/installer or service provider?
   ☐ Telephone ☐ Verbal communication ☐ Walked to the supplier

5. What made you decide to buy the Sato pan?
   _____

C. Sanitation facility type/cost

6. What type of latrine does the household have?

☐ VIP/Pit Latrine ☐ Traditional pit Latrine ☐ Pour Flush ☐ Other:

Specify: _____

7. For how long have you used the toilet with the Sato pan?
   _____
8. How many people use the latrine? _____
9. How much did you pay for the Sato pan? _____
10. Who made the decision to buy the Sato pan? ☐ Mother/wife ☐ Father /Husband ☐
    Other: Specify …….
11. How long did construction take _____days/Weeks
12. Do any of your neighbours have a Sato pan? (Yes/No)
13. Where did they get their pan from?

D. Satisfaction:

14. Are you satisfied with the Sato pan?
    a. Very satisfied
    b. Satisfied
    c. Neither satisfied nor dissatisfied
    d. Dissatisfied
    e. Very Dissatisfied

15. If very satisfied or satisfied, why?
    a. No smell
    b. No flies
    c. Looks modern
    d. Fair price
    e. Other: _____

16. What did you like most about the Sato pan? _____

17. If dissatisfied, why?
    a. Takes a lot of water to flush
    b. Hard to clean
    c. Expensive
    d. Other: _____

18. Generally did it meet your expectation?
    a. Yes
    b. No

19. Did the service provider/ VHT/ local mason respond quickly to your initial request?
    a. Yes
    b. No

20. If No, how long did it take? _____

21. How much did you pay for the installation of the Sato Pan? _____

22. How far is the provider of your Sato pan (VHT) from your house?
    _____

23. What do you think about the price of the Sato pan
    a. Very expensive
    b. Expensive

c. Affordable
d. Cheap

24. How much water do you use per flush? _____

25. How much water do you use per day as a family? _____

26. What kind of water do you use for flushing? Grey/tap/borehole/water

27. Do you have any challenges with water availability?

☐ YES ☐ NO

28. If yes how do you flush the toilet?

25. Is the toilet filling up due to water? (Ask/ observe)

☐ YES ☐ NO

26. Was the installation service carried out in a clean and hygienic manner?

a. Strongly agree
b. Agree
c. Don't agree
d. Strongly disagree

27. Was the service completed in time?
a. Yes
b. No

28. Was the service of high quality?
a. Yes
b. No

29. If No, what went wrong? _____

30: Would you recommend the service to another customer?
a. Yes
b. No

Not installed:

B. Service Provider

29. How did you know about the Sato pans (Entrepreneur)?

☐ A Friend ☐ Hard ware shop ☐ Radio advert ☐ Leaflets/ Poster ☐ VHT ☐ NGO ☐
Other: Specify_____

30. Name of Sanitation Service Provider: _____

31. Location of provider: _____

---

32. How did you contact the supplier/ local masons/installer or service provider?
☐ Telephone ☐ Verbal communication ☐ Walked to the supplier

33. What made you decide to buy the Sato pan?
_____

34. How far is the provider of your Sato pan (VHT/NGO? Etc...) From your house?
_____

35. What type of latrine does the household have?

☐ VIP/Pit Latrine ☐ Traditional pit Latrine ☐ Pour Flush ☐ Other:

Specify: _____

36. How many people use you latrine? _____
37. How much did you pay for the Sato pan? _____

38. Who made the decision to buy the Sato pan? ☐ Mother/wife ☐ Father /Husband ☐
Other: Specify …….

39. Do any of your neighbours have a Sato pan? (Yes/No)

40. Where did they get their pan from? _____

41. Do you think the Sato pan was a reasonable price?
_____

42. Why haven't you installed the Sato Pan yet?
    _____

43. Does anyone in your household have any experience with construction of latrines or houses? _____

44. Do you know where to find an installer for the sat pan?
    _____

45. Do you believe that you could install the pan yourself?
    _____

46. How much do you think it would cost to self-install, including materials?
    _____

47. How long do you think it would take to self-install?
    _____

Annex Five: Coding scheme for Household Survey

Question Code	Variable	Instruction
A1.	HH_ID	Fill in number of household ID #
A2.	Date	Fill in date: dd-mm-yyyy
A3.	Interviewer	1 = Annet 2 = David
A4.	Observer	1 = Milande 2 = Steven
A5.	District	1 = Arua 2 = (Ruwenzori)
A6.	Subcounty	1 = Oluko (LCB interventions) 2 = Uriama (LCB interventions) 3 = Manibe 4 = Ajia
A7.	Parish	1 = Yabiavoko 2 = Turu 3 = Akinio 4 = Ejomi 5 = Otumbari 6 = Olufe 7 = Eleku 8 = Ajia 9 = Ombokoro
A8.	Village	1 = Rabala 2 = Drimu 3 = Perea 4 = Erepea 5 = Otumbari 6 = Okupaliri 7 = Agorovu 8 = Ombamba 9 = Oyeku
B1.	Gender	1 = Male 2 = Female
B2.	Householdhead	1 = Yes 0 = No
B3	Occupation	1 = Peasant farmer 2 = Farmer 3 = VHT (Village Health Team) 4 = Student 5 = Housewife 6 = LC 1 (local council level 1) 7 = Business men/women 8 = Policeman 9 = Pastor (religious leader)

B4.	Age	Fill in Number
B5.	Language	1 = Lugbara 2 = Lanawage (HHID#10) 3 = English and Lugbara
B6.	Religion	1 = Catholic 2 = Protestant 3 = Islam
B7	Education	1 = None 2 = Some primary 3 = Full primary 4 = Some secondary 5 = Full secondary 6 = Higher
B8.	Tribe (clans people are from)	1 = Lugbara 2 = Obi 3 = Kura 4 = Ombokoro 5 = Yole 6 = Turu 7 = Pajulu 8 = Orivu 9 = Muteso 10 = Aripizaci 11 = Aripi 12 = Maraju 13 = Siripi 14 = Nyo 15 = Noki 16 = Osua 17 = Nyaranga 18 = Aawa 19 = Yivu 20 = Kuli 21 = Asiyu 22 = Ocopi 23 = Abiru 24 = Ariapi 25 = Ara 26 = mingoro 27 = Aya 28 = Agorovu 29 = Oreko 30 = Ombamba 31 = Vurra 32 = Adumi 33 = Ajia 34 = Odravu 35 = Ocoko

		36 = Oceku 37 = Ayalangi 38 = Yurra 39 = Akulua 40 = Olaka 41 = Orevu 42 = Madi
C1.	RoofHouse	1 = Grass thatched 2 = Iron sheet
C2.	FloorHouse	1 = Stones connected with mud 2 = Water and Mud (mortar) 3 = Brick 4 = Cemented
C3.	WallsHouse	1 = Mortar (mud) 2 = Bricks
D1.	HaveLatrine	1 = Yes 0 = No
D2	TypeofLATRINE	1 = Flush/pour flush toilet 2 = Ventilated improved pit latrine (VIP) 3 = Pit latrine with slab 4 = Pit latrine without slab 5 = Composting toilet 6 = Urine diversion toilet 7 = Bucket 8 = Hanging toilet or hanging latrine 9 = other
G1	Whybuild	1=Prevent OD 2=Hosting guests 3=shameful to not 4=comfort in rains
G2	Timehadlatrine	Enter x in years
G3	Prevowner	1 = Yes 0 = No
G4	prevlatDEMISE	1=Collapse 2=Moved homestead 3=Filled up 4=other
G5	Sharing	1 = Yes 0 = No
G6	Personalsharingfamily	1 = Yes 0 = No
G6a	PersonalsharingNeighbors	1 = Yes 0 = No
G6b	PersonalsharingOthers	1 = Yes 0 = No

G7	diffINowner	1=healthier 2=don't have to OD 3=seen better in comm 4=have more money 5=more responsible
G8	explforNONOWNERS	1=lazy 2=ignorant 3=no funds 4=sharing 5=building in progress
H1	FavFeatures	1=Its affordable 2=Good for guests 3=Easy to construct 4=Comfortable for family 5=Easy to use
H2	dilikeFEATURES	1=Roof needs to be replaced 2=Rats can enter 3=Its temporary 4=Hard to clean 5=Slab is failing 6=No soap available 7=smell 8=flies
H3	ImprovDESIRE	1=Plaster/smear the brick walls 2=Replace roof 3=Fix rat holes 4=Make a hole cover
H4	LVLsatis	1=Very satisfied 2=Satisfied 3=Neutral 4=Dissatisfied 5=Very dissatisfied
H5	fillUP	1 = Yes 0 = No
H6	Learn2build	1=FromLCB 2=From working as a mason 3=From family 4=From neighbor 5=from community
H7	Householdchoice	1=Head of HH 2=Family choice 3=Self 4=Spouse
I1	Selfconstr	1 = Yes 0 = No
I2	pitdugWAY	1= Community/Family

		2= Pit Digger 3= self-dug
I3	locationofDGGER	Enter x for distance in KM
I4	WayofFINDIGNpit	1= Through family 2= Saw provider working 3=Was referred by another person
I5	Pitdepth	Enter X in feet
I6	pitcollaps	1= Yes 0= No
I7	Rection2collapse	1=Shared with neighbor 2=Began construing new 3=OD
I8	masondistance	Enter distance to mason in x km
I8a	masoncontact	1=phone 2=close-by to meet 3=traveled
I9	Pay4slb	Enter price paid for slab in UGX
I10	Pitcost	Enter price paid for pit in UGX
I10a	Pitcost2	1= Yes 0= No
I11	LocationofserviceMason	Enter distance x in KM
I11a	LocationofservicePit	Enter distance x in KM
I11b	LocationofserviceConcrete	Enter distance x in KM
I12	DistancetoserviceHYPOMason	Enter distance x in KM
I12a	DistancetoserviceHYPOPit	Enter distance x in KM
I12b	DistancetoserviceHYPOConcrete	Enter distance x in KM
I13	paid	Enter amount pain in UGX
I13a	paidmason	Enter amount pain in UGX
I13b	paidconcrete	Enter amount pain in UGX
I13c	paidslab	Enter amount pain in UGX
I14	maxprice	Enter amount pain in UGX
I14a	Maxpricemason	Enter amount pain in UGX
I14b	Maxpriceconcrete	Enter amount pain in UGX
I14c	maxpriceslab	Enter amount pain in UGX
I15	Consttime	Enter X in weeks
I16	satisfactionwithconst	1=Very satisfied 2=Satisfied 3=Neutral 4=Dissatisfied 5=Very dissatisfied
I17`	Satoaware	1 = Yes 0 = No
I18	SatoOWN	1 = Yes 0 = No
J1	assitinCONST	1=Family 2=Community 3=self-made

J2	Pitdepth	Enter X in feet
J3	timetoDIG	Enter X in weeks
J4	typeMAT	1=wood 2=brick 3=concrete
J4q	MatsSLABlocifWOOD	1=From Garden (wood) 2=From Shop 3=From neighbor 4=From village
J5	TRNSmat	1=bike 2=Boda 3=Car 4=By foot
K1	Payforconst	1 = Yes 0 = No
K2	Selfconst	1 = Yes 0 = No
K3	Prevention	1=lackoffunds 2=sickness 3=absent HHH 4=poor soils 5=inprogress
K4	Satoaware	1 = Yes 0 = No
K5	Ownsato	1 = Yes 0 = No
K6	latrinePASTown	1 = Yes 0 = No
K7	pastlatFAIL	1=Collapse 2=Moved homestead 3=Filled up 4=other
K8	Shareing2	1 = Yes 0 = No
K9	perceptofLAT2	1=healthier 2=don't have to OD 3=seen better in comm 4=have more money 5=more responsible
K10	WhynoLAt2	1=lazy 2=ignorant 3=no funds 4=sharing 5=building in progress
L1	Servicesaware	1 = Yes 0 = No

L1a	Servicesawaremason	1 = Yes 0 = No
L1b	Servicesawarepitdigger	1 = Yes 0 = No
L1c	Servicesawareconcrete	1 = Yes 0 = No
L2	issueswithVAIL	1 = Yes 0 = No
L2a	specificMISSserv	1=mason 2=pitdiggers 3=concrete
L3	SatisfctionlvlofSERV	1=Very satisfied 2=Satisfied 3=Neutral 4=Dissatisfied 5=Very dissatisfied
L4	locofSERVslab	Enter distance x in KM
L4a	locofSERVmason	Enter distance x in KM
L4b	locofSERVPitdigger	Enter distance x in KM
L4c	locofSERVconcrete	Enter distance x in KM
L5	avgDISTslab	Enter distance x in KM
	avgDISTmason	Enter distance x in KM
	avgDISTpitdigger	Enter distance x in KM
	avgDISTconcrete	Enter distance x in KM
L6	affordible	1 = Yes 0 = No
L7	perceptofPRICE	1 = Yes 0 = No
L8	PereptofPRICE2slab	Enter max price x in UGX
	PereptofPRICE2mason	Enter max price x in UGX
	PereptofPRICE2pitdigger	Enter max price x in UGX
	PereptofPRICE2concrete	Enter max price x in UGX
L9	assistinCONST2	1=Family 2=Community 3=self-build
L10	Mostdiff	1=slab 2=pit 3=wall 4=roof
L11	typelatrine	1 = Flush/pour flush toilet 2 = Ventilated improved pit latrine (VIP) 3 = Pit latrine with slab 4 = Pit latrine without slab 5 = Composting toilet 6 = Urine diversion toilet 7 = Bucket

		8 = Hanging toilet or hanging latrine 9 = other

Annex Six: Coding Scheme for Service Providers

B1	Makingslabs	1=Yes 2=No
B2	ifnotPREVENT	1=I am learning how to soon 2=I am currently learning
B3	howlongWORK	Enter number of years
B4	Learn trde	1=From family member 2=On site, apprentice 3=tradeschool
B5	Distanceforcust	1=parish 2=district 3=specified km 4=city
B6	Averagepriceaggregate	Enter UGX for price
B6a	Averagepriceslab	Enter UGX for price
B6b	Averagepricelatrine	Enter UGX for price
B7	transport	1=by foot 2=boda 3=car 4=bike
B8	Materialslocation	1=insideparish 2=insidevillage 3=insideAruacity 4=from distributer 5=delivered by salesmen
B9	Competition	1=yes 0=no
B9a	Compititon2	1=from insde the city 2=from neighboring shops 3=from new business
B10	tradscool	1=yes 2=no
B10a	Tradscooldistance	Enter distance in km
B11	newcustfine	1=they come to us 2=we go looking for them 3=we advertise 4=word of mouth

		5=we dont
B12	newcustdiscover	1=yes 0=no
B13	numberofjobs	Enter number of slabs
B13a	numberofjobstonnage	Enter amount of aggragte
B13b	numberofjobsmasons	Enteramount of completed structures/latrines
B14	newcustoutreach	1=I am fine with the amount of customers 2=I hope to advertise 3=no
B15	Rateorservice	Enter rate of hire for x here
B16	Coworkers	Enter amount of co workers

Annex Seven: Recorded answers for Pit emptiers

B1. When was this company founded?

#	Company
	Zebra Hotel LTD
1	2013
	Right brother's cess pool emptier services.
2	2001
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	1992
	West Nile cleaning and Waste Services.
4	1999

B2. How many vehicles do you have for empting latrines?

#	Company
	Zebra Hotel LTD
1	One vehicle.
	Right brother's cess pool emptier services.
2	3 vehicles.
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	1 vehicle.
	West Nile cleaning and Waste Services.
4	1 vehicle.

B3. What sub counties do you operate in?

#	Company
	Zebra Hotel LTD
1	In Arua Municipality and Ariwara in Congo (DRC).
	Right brother's cess pool emptier services.
2	Arua, Koboko, Yuwube, Nebbi, Moyo, Adjumani, and Zombo/Paida.
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	Arua town, Koboko, and Keji Keji – South Sudan.
	West Nile cleaning and Waste Services.
4	Amur, Koboko, Arua, Nebbi, Oraba.

B4 .How long have you been working in this service?

#	Company
	Zebra Hotel LTD
1	2 years.
	Right brother's cess pool emptier services.
2	9 years (2006-2015).
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	16 years.
	West Nile cleaning and Waste Services.
4	15 years.

B5. Where did you learn this trade from?

#	Company
	Zebra Hotel LTD
1	Trained in Arua town at the Arua primary by the company that sold the car to me. Also, another training organized by Arua municipal authority at Arua hospital.
	Right brother's cess pool emptier services.
2	991
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	I learnt from my brother who is the proprietor.
	West Nile cleaning and Waste Services.
4	I trained from Kampala.

B6. How far would you travel to find a new customer?

#	Company
	Zebra Hotel LTD
1	Within 3 km range in Arua municipality while 150 km if hired by new customer
	Right brother's cess pool emptier services.
2	Customers come all over westnile region.

	MASH auto dealers/ Taban Ali Hunina Transport service.
3	Customers come to us.
	West Nile cleaning and Waste Services.
4	Covers West Nile districts.

B7. What is the average price you charge for your service?

#	Company
	Zebra Hotel LTD
1	1 trip is at 100,000. To empty the truck we are charged 20,000. Dinner 10,000.
	Right brother's cess pool emptier services.
2	120,000 per trip (town service). Outside town depends on distance covered. Have to charge 20,000 to pay for dumping site (jiako).
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	Within municipality is 120,000 per trip. Out of this 20,000 for dumping.
	West Nile cleaning and Waste Services.
4	120,000 per trip (town service). Outside Arua town is determined by the distance travelled. Pay/charge 20,000 to dump the truck

B8. Where do you dump the waste that you collect?

#	Company
	Zebra Hotel LTD
1	Jiako- Dadamu sub-county.
	Right brother's cess pool emptier services.
2	Arivu-Jiako (Dadamu sub-county).
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	Jiako-Dadamu sub-county.
	West Nile cleaning and Waste Services.
4	Jiako-Dadamu sub-county.

B9. How many jobs do you complete a week?

#	Company
	Zebra Hotel LTD
1	2-3 trips a week.
	Right brother's cess pool emptier services.
2	On average 2 in a week.
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	In dry season 1 on average. In rainy season 4-5 trips a week on average.
	West Nile cleaning and Waste Services.
4	Once or so a week lately, the dry season is slow

B10. Do you have much competition for your service in the area?

#	Company
	Zebra Hotel LTD
1	Not much competition.
	Right brother's cess pool emptier services.
2	Yes, there is competition, but we are the biggest so we don't worry
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	Yes, there is competition.
	West Nile cleaning and Waste Services.
4	Yes, there is competition.

B11. If so then who?

#	Company
	Zebra Hotel LTD
1	By Right Bros
	Right brother's cess pool emptier services.
2	1, zebra. 2, Zamzam. 3, Oayia tom.
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	1, Right brothers. 2, Zebra. 3, Ocayia Tony.
	West Nile cleaning and Waste Services.
4	1, Right brothers. 2, Zebra. 3, Hanina Ali.

B12. Who is the biggest waste emptying service in this District?

#	Company
	Zebra Hotel LTD
1	Not certain.
	Right brother's cess pool emptier services.
2	Right brothers pool services ltd.
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	Right brothers.
	West Nile cleaning and Waste Services.
4	Right brothers.

B13. What types of issues do you encounter in the field?

#	Company
	Zebra Hotel LTD
1	Vehicles get stuck during rains. Mechanical break downs.

	Right brother's cess pool emptier services.
2	Complaints from residents around disposal sites I.E. absence of a dump lagoon in town. Poor road to dumping site.
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	1, customers keep shifting from one service provider to another. 2, competition among service providers. 3, mechanical break downs.
	West Nile cleaning and Waste Services.
4	1, Only one dumping site in this district yet we pay the landlords 10,000 monthly and 20,000 per trip. 2, only one dumping site. 3, mechanical issues with the truck

B14. How does the demand for your service change in Rainy season?

#	Company
	Zebra Hotel LTD
1	More money in rainy season due to water filling pits.
	Right brother's cess pool emptier services.
2	Services are more frequent during rainy season compared to dry season.
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	Better business during rains since water enters the toilets causing it to fill up, then they hire us
	West Nile cleaning and Waste Services.
4	More work in rainy season as compared to dry season.

B15. Which season creates the most demand?

#	Company
	Zebra Hotel LTD
1	Rainy season.
	Right brother's cess pool emptier services.
2	Rainy season
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	More money during rainy season than dry season.
	West Nile cleaning and Waste Services.
4	Rainy season.

B16. Do you empty both septic and pit latrines?

#	Company
	Zebra Hotel LTD
1	Only septic tanks.
	Right brother's cess pool emptier services.
2	Only septic.

	MASH auto dealers/ Taban Ali Hunina Transport service.
3	Septic tanks only.
	West Nile cleaning and Waste Services.
4	Septic tanks and vip toilets.

B17. If so, which is more in demand?

#	Company
	Zebra Hotel LTD
1	Septic tanks.
	Right brother's cess pool emptier services.
2	Septic.
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	Septic.
	West Nile cleaning and Waste Services.
4	Septic tanks.

B18. Did you attend a trade school?

#	Company
	Zebra Hotel LTD
1	Company that sold us the vehicle trained us.
	Right brother's cess pool emptier services.
2	From my employer.
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	My brother learned from Kampala and I learned from him. He was the first service provider.
	West Nile cleaning and Waste Services.
4	Yes, in Kampala.

B19. How do you find new customers?

#	Company
	Zebra Hotel LTD
1	Customers approach us.
	Right brother's cess pool emptier services.
2	Customers do approach is on phone or physical to our offices.
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	Customers come by themselves. Neighbours to our customers get to know about us.
	West Nile cleaning and Waste Services.
4	Customers approach us.

B20. Do you have many people you don't know approach you for service?

#	Company
	Zebra Hotel LTD
1	Yes, but more of friends or those served before.
	Right brother's cess pool emptier services.
2	Yes, they do come, but they call on the phone
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	Yes, they do call us, many time we haven't served them before.
	West Nile cleaning and Waste Services.
4	Yes, they do come.

B21. How many jobs have you completed in the last 2 months?

#	Company
	Zebra Hotel LTD
1	Only 1.
	Right brother's cess pool emptier services.
2	10 trips.
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	4 trips.
	West Nile cleaning and Waste Services.
4	4 trips.

B22. Do you feel that you could do anything to reach more customers?

#	Company
	Zebra Hotel LTD
1	No.
	Right brother's cess pool emptier services.
2	No.
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	Enter into contract with public toilet operations e.g. Chakala. 1, reduce on some prices or go outside of Uganda into Sudan to new customers. Offer some time to get more. **********
	West Nile cleaning and Waste Services.
4	Approach schools outside town and enter into contact with them.

B23. How has you rate charge for service changed in the past year?

#	Company
	Zebra Hotel LTD

1	No, we charge the same rate.
	Right brother's cess pool emptier services.
2	Charges have increased from 80,000 to 120,000 with increasing fuel prices.
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	My prices have remained stable, yet the rate I am hired has gone down as a result of competition in the area.
	West Nile cleaning and Waste Services.
4	Yes, the price has increased little.

B24. How many people work with you on these jobs?

#	Company
	Zebra Hotel LTD
1	2 people.
	Right brother's cess pool emptier services.
2	4 people employed for 3 vehicles.
	MASH auto dealers/ Taban Ali Hunina Transport service.
3	2 people.
	West Nile cleaning and Waste Services.
4	3 people.

Special notes from the providers.	
Right bros	Truck price and driver experience are a huge barrier to entry into the market. It is also seen as shameful and a non-respected job to drive faeces around. It is demeaning in some ways. The trucks cost around 80 million, and the owner captures most of the profit from the trips. Many drivers want to own their own trucks, yet the massive upfront cost stops them from purchasing one. These trucks are only imported from china, and it is impossible to retrofit a lorry to become an emptying truck.
MASH	There is more work now than before compared to 2 years ago. This is a result of new septic systems being constructed in the area, along with Rhino camp becoming more populated and UNHCR building more toilet

	systems to meet population demands at the camp. Many of the workers here don't much like working in the biz as they see it as very dirty and smelly. They communicated that this may be a reason that more people don't enter the biz. They also said they make decent money, but they feel that other work may be the better route. The man we interviewed stated that he wants to be in a management position in the future so he doesn't have to get dirty.