

SANITATION VALUE CHAINS IN LOW DENSITY SETTINGS IN VIETNAM



ABOUT THE AUTHORS

The Institute for Sustainable Futures (ISF) was established by the University of Technology Sydney to work with industry, government and the community to develop sustainable futures through research and consultancy. Our mission is to create change toward sustainable futures that protect and enhance the environment, human well-being and social equity.

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'Enterprise in WASH' is a joint research project led by the Institute for Sustainable Futures (ISF) at the University of Technology Sydney, which investigates the role of private and social enterprises in the delivery of water, sanitation and hygiene (WASH) services for the poor. Partner organisations are shown below. For other Enterprise in WASH publications, see www.enterpriseinwash.info























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1 EXECUTIVE SUMMARY

Introduction

This study examines the sanitation supply chain in two rural, remote districts in Vietnam. A value chain analysis was used to assess various elements of the chain, and to develop strategies to improve the supply of affordable hygienic sanitation for poor communities in rural and remote areas of Vietnam. Primary research was undertaken in Muong Ang District (in Dien Bien Province) and Mai Chau District (in Hoa Binh Province) in 2014 by the Institute for Sustainable Futures, University of Technology Sydney with SNV Netherlands Development Organisation.

The question addressed by this research emerged from practitioners in development agencies attempting to support and strengthen supply chains for sanitation products in rural areas. Such areas face challenges regarding difficult logistics and high costs involved in transporting materials to build toilets in remote locations. This raised a question about the viability of market-based approaches (e.g. sanitation marketing) to address low sanitation coverage in remote rural areas, and an interest in investigating the actual costs along supply chains, including across different remote, rural locations.

Methodology

There were three main research objectives:

- 1) To map and correlate latrine costs against poverty levels, toilet coverage and other sociodemographic dimensions in remote, rural areas;
- 2) To analyse the viability of market-based solutions for sanitation products in low-density, remote areas, including the impact of distance and transport cost and
- 3) To identify strategies that could support availability of affordable, acceptable products for the poor in remote, rural areas, with a key focus on the enabling environment for pro-poor business development.

This research methodology was based on a value chain analysis, working backwards from the costs of component materials to build toilets at households in two districts of Dien Bien and Hoa Binh Provinces. For externally sourced materials such as cement and toilet pans, we followed the links up the supply chain to local materials shops, to district and provincial shops and distributors to producers and manufacturers. The study also considered the prices and availability of locally sourced materials.

The research drew on both quantitative and qualitative data which were collected from primary sources, through structured interviews with households, retailers, producers, transport operators and local government officials. A parallel study on rural value chains led by the Water and Sanitation Program and supported by SNV also informed the research.

Results

In both Muong Ang and Mai Chau, there was a strong correlation between poverty, low hygienic toilet coverage and high costs of toilets. In the remote communes, poverty was highest and hygienic latrine coverage was lowest, corresponding to high toilet costs. This indicates there may be a case to target locations with high poverty rates and high costs of toilet provisions.

The costs of toilets for households in this research far exceeded the government's estimates, with some being up to 3.5 times the costs provided from the government for some toilet types (e.g. double vault latrines). This highlights the need for support to remote households to access affordable sanitation. Total cost of materials for toilets were higher in Mai Chau district, which was in part attributed to the need to purchase and transport sand, given it was not locally available as it was in Muong Ang. Transport costs were also higher in Mai Chau district, however this can in part be explained by the locations where data was collected (more remote and difficult to access villages were included in Mai Chau).

Households in remote villages faced barriers in transporting materials to their homes due to poor quality roads that were often inaccessible by truck and were steep, slippery and muddy. Motor bike transport and access on foot was usually the means in which materials were brought to these remote locations. Costing the transportation of sanitation materials usually involved a combination of methods including formal truck transporters (to points where road access permitted), motor bike, boat and on foot using local labourers. Such transport was either self-arranged, where households took opportunistic approaches in doing so (i.e. coming home by motor bike with a load of materials after going to the village for other purposes) or through truck transporters, who acted as a middle-man in purchasing then transporting materials to as close as possible to the household.

The cost (both time and monetary) and effort of arranging such transport was therefore high, even for the transportation of simple latrines with the smallest quantity of materials. This was therefore a significant barrier to households accessing even the simplest of hygienic latrine options.

The major material components to build toilets included cement, bricks, iron, sand, roof tiles (used for superstructure) and a toilet pan (only present in septic tank latrines). Apart from the toilet pan, these materials were common construction materials and were readily accessible in the district towns and in many commune centres.

In both districts, the material that comprised the highest proportional cost was bricks. The proportional cost of transport (when compared to materials) was highest for the difficult to reach villages – this was over 60% for some locations. Variation in costs across different locations were also due to supply chain costs influencing the price of materials; accessibility of locally available products (e.g. where sand was locally available in Muong Ang, costs were significantly reduced); and competition between shops, which kept prices similar.

Material supply shops widely accepted credit from customers and in turn, this restricted their cash flow and thus their ability to provide further discounts and provisions for the poor. Shops were important actors in the sanitation supply chain, stocking all materials for latrines as well as a broader range of other construction related materials. Some shops owned their own trucks to enable the delivery of their products; others had informal relationships with transport providers for delivery, while smaller informal shops did not have delivery options. Many shops were family run, with some having formal legal status. While competition with other shops in the same town / commune was acknowledged by shop owners, marketing or advertising activities were not practiced by any shop owners. Low profit margins were accepted by shop owners for some products (e.g. cement). Discounts, concessions and credit as a form of payment were common practice to enable the predominantly poor customers to purchase products. These practices constrained the financial capacity of shop owners, who were required to pay their own suppliers at the time of purchase.

Responsibility for sanitation at the national level lies with the Ministry of Health. At the local level, commitment to improving hygienic latrine coverage varied. In Muong Ang and Mai Chau where SNV had worked at the provincial, district and commune level, there was some degree of commitment; however this was hampered by budgetary allocations to sanitation which relied upon provincial decision makers.

Support for private enterprise was also present at the national level (however a policy is still lacking), including support for enterprise engagement in sanitation. It remains to be seen how this support will flow to sub-national levels of government where much of the decision making power lies, and hence the reality for businesses depends on the provincial interpretation of national support.

Actions to optimise the supply chain

The results from this research in Muong Ang and Mai Chau districts illustrate the major increase in the cost of latrines in remote locations is due to transport and distance. This is particularly evident when costs found in this research are compared to estimates provided by Ministry of Health. As well as the barrier of cost, there is also the practical barrier of arranging the physical transportation of the materials to remote households with highly challenging logistics.

To fulfil the objective of improving the availability and affordability of products and services to build toilets, particularly in areas of higher poverty, there are a range of actions which can be considered. Some key points concerning the findings of this study that should inform development of such strategies are as follows.

Improving access to finance for customers: Approaches that can reduce the outlay for poor households, including better managed loans from Vietnam Bank for Social Policy (VBSP) with facilitation assistance from mass organisations, may help poor households to access sanitation.

Organising communities for collective purchasing: Communities could be encouraged and supported to buy materials as collectives to reduce costs. Both community leaders and government staff could promote this approach, and apply incentives (such as time-bound financial support) to support development of momentum and action.

Targeting transportation of sanitation materials: Targeted government subsidies to account for the increase in the cost of latrines in remote locations could be developed to assist in removing the barrier of cost and distance.

Target bricks as the most costly component of toilet costs: The high proportional cost of bricks highlights that influencing the cost of latrines may involve investigating alternate materials, such as concrete rings. In some locations moulds for making concrete rings have been shared for use by communities and could help overcome some aspects of the logistical challenge.

Reconsider appropriate technology and design: Further effort should be directed to research and innovation concerning design of toilets suitable for remote, difficult to reach locations, including use of light-weight and locally sourced materials.

Improving community understanding of hygienic sanitation options: In remote villages, households had limited awareness of the types of sanitation options that were available. Local government and CSOs, together with Women's Union staff could therefore work to raise the

understanding of poor, remote households of the various more affordable types of sanitation that are available.

Smart targeted subsidies: Design of a 'smart subsidy' involves considering issues in the local context and 'designing-in' mitigating strategies for any disadvantages. Some subsidies involve partnerships or contracts with supply shops, and require several steps in their development to ensure equitable participation of supply chain actors and ensure agreements are transparent and upheld.

2 INTRODUCTION

This document presents research on the sanitation hardware supply in low density settings in Vietnam. The research involved a value chain analysis and examined strategies to improve the supply of affordable sanitation products. The research was undertaken in two districts in two rural provinces in Vietnam: Muong Ang district (Dien Bien province) and Mai Chau district (Hoa Binh province).

2.1 BACKGROUND AND OBJECTIVES

2.1.1 Background

Water, sanitation and hygiene (WASH) in Vietnam has, in the past, been supported by government and donor inputs. The National Target Program for Rural Water Supply and Sanitation (NTP), with contributions from both government and donors, has dominated the drive to expand access to water and sanitation since 1988, and is currently in its third phase (2011-2015). A key difference to earlier phases is the greater emphasis on sanitation, with the Ministry of Health (specifically Vietnam Health Environment Management Agency, VIHEMA) formally allocated authority for rural sanitation in terms of planning, monitoring and implementation, especially of household latrines (Gero and Willetts, 2014). Another difference is that as Vietnam has emerged as a middle income country, donors have begun withdrawing support. The national government is therefore increasingly responsible for resourcing outstanding inequalities particularly in rural and remote areas, where progress towards addressing inequities remains a challenge.

Non-government organisations (NGOs) have also been working to expand WASH coverage in Vietnam. In the sanitation subsector, this was initially through demand creation schemes (e.g. Community Led Total Sanitation, CLTS), and more recently, through sanitation marketing techniques as a means to meet newly established community demand for sanitation.

Government interest in private sector engagement is also increasing, including in the WASH sector, however despite some progress (e.g. "Decision 131" of 2009 – see Gero and Willetts, 2014), a formalised policy is yet to be released for private sector participation in WASH.

Globally, the development sector is expressing widespread interest and investment in sanitation marketing, and viewing an increasing role of the private sector as a means to provide sustainable WASH access, including for the poor. However, there remains scant evidence that this approach is appropriate in a range of settings, for example in rural, remote, low density areas where availability and cost of materials are starkly different to those in urban areas. This research investigates the potential for private enterprise engagement in sanitation in low-density settings through a value chain analysis in rural two districts in Vietnam.

2.1.2 Research objectives

The objectives of this research were:

[1] To map and correlate latrine costs against poverty levels, toilet coverage and other sociodemographic dimensions in remote, rural areas;

- [2] To analyse the viability of market-based solutions for sanitation products in low-density areas, including the impact of distance and transport cost;
- [3] To identify strategies that could support availability of affordable, acceptable products for the poor in remote, rural areas, with a key focus on the enabling environment for pro-poor business development.

In line with the above objectives, the research aimed to:

- Identify the main actors, processes and links in the value-chain of sanitation hardware in two low density settings in Vietnam;
- Identify the costs, earnings profiles and financial performance of different links along the value-chain of sanitation hardware in Vietnam;
- Examine critical links, their strengths and weaknesses, and the factors affecting them, including the influence of transport and accessibility on the value-chain;
- Assess possible actions that can be taken to improve the sustainability of the valuechain of sanitation hardware in Vietnam; and
- Assess government policy and regulatory framework in terms of their suitability for the improvement of the value-chain of sanitation hardware in Vietnam.

2.1.3 Research questions

The research questions were as follows:

- 1. What is the relationship between poverty, toilet coverage and costs of sanitation products in low density locations in rural Vietnam?
- 2. What is the distribution of the value between the nodes in the value-chain? How does the value change along the nodes?
- 3. Why does the chain look the way it does? How could the enabling environment better support development of the supply chain for sanitation products?
- 4. How can the supply chain be optimised or subsidised to reduce costs of sanitation products to households in low-density locations in Vietnam?

2.1.4 Research framework

This research was based on a value-chain analysis (VCA). This type of analysis, which was originally used for business studies in 1980s, has recently become more popular in the area of development research.

Value-chain analysis depicts a sequence of related enterprises that conduct value-adding activity to a particular product, from its primary production, through its packaging and distribution, to the final sale of the product to consumers. By depicting the value-chain, it is possible to understand the work of the chain as a whole, the function of each link along the chain and the influence of parties outside the chain. The research mapped the value chain, and examined costs, outputs and the physical flow of commodities along the chain (Kaplinsky and Morris, 2001).

There were at least three types of actors that were covered in this research, namely:

1. Value-chain actors and their linkages, which consist of primary producers, distributors (including retailers and transport providers), and consumers as the end-users;

- 2. Business environment actors, which refers to government officials responsible for the provision and maintenance of infrastructure, as well as for the development of policies, laws and institutions that influence how the market system works; and
- 3. Business development service providers, which include businesses and government extension services that support the value-chain, such as training, consultancy, marketing assistance, financial institutions or credit providers

For reasons of scope, value chain analysis in this research was started from the bottom-up, that is, from the end-user, tracing relevant products from the household level up through the supply-chain. In addition, and also for reasons of scope, a core focus was maintained on the supply chain rather than demand-side, such as willingness to pay or demand-side behaviour.

There are a number of key known issues for sanitation value chain actors. Based on a systematic literature review of enterprise engagement in water and sanitation (Gero et al., 2013) and political economy analysis of dynamics shaping enterprise involvement in Vietnam (Gero and Willetts, 2014), the following areas were investigated as part of clarifying key issues affecting actors in the supply-chain:

- Access to credit
- Nature of personal and business relationships between actors in the chain
- Legal status of businesses (if legalised/formalised or not)
- Availability of and access to business support e.g. training
- Nature of current consumer demand
- Level of entrepreneurship, risk taking etc.

2.2 METHODOLOGICAL DESIGN

2.2.1 Data and data collection

This research employed both quantitative and qualitative data. These data were collected from primary sources, through structured interviews with households, retailers, distributors, producers and local government officials.

A secondary source of data was from another study, led by the Water and Sanitation Program (WSP - a multi-donor partnership and part of the World Bank) and supported by SNV – who also partnered on this research. WSP/SNV's project was also conducted in Hoa Binh Province (and in part, in Mai Chau district) and was called "Rural Sanitation Demand Creation and Supply Chain Development for Scaling Up Rural Sanitation in Hoa Binh Province". The similarities between the two projects allowed for some sharing of methods and results. As such, our research draws on findings of the WSP / SNV study for section 4.

2.2.2 Sample and sampling method

This research focused on two districts in Vietnam, namely Muong Ang (in Dien Bien Province) and Mai Chau (in Hoa Binh Province) – see Figure 1. These were selected where SNV Vietnam is (or recently has been) conducting sanitation programs on the basis of the following criteria: socio-economic status, sanitation coverage, accessibility and remoteness and population density.

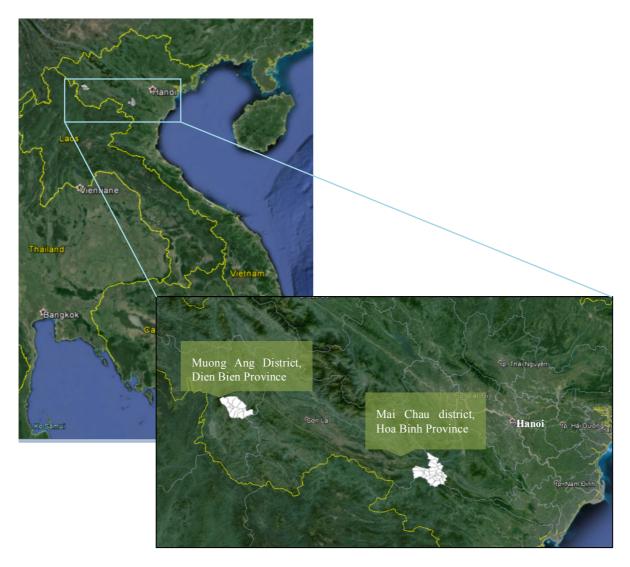


Figure 1: Map showing Muong Ang and Mai Chau districts

Muong Ang district comprises 10 communes, whereas Mai Chau district consists of 23 communes. A scoping phase of the research was undertaken in January 2014, and involved the collection of data from five communes in Muong Ang using purposive sampling. Additional data was collected from three communes in Muong Ang and four communes in Mai Chau in August/September 2014. For the latter phase of data collection a slightly different and more systematic approach was taken. Within each commune, three villages were chosen as areas to sample, representing villages whose location is closest to the commune's capital, villages whose location is farthest from the commune's capital and villages whose location is somewhere in between. The data was collected from each sample village based on convenience sampling method (households, masons or other key informants).

The sample of retailers, distributors/producers, and transport and credit providers was chosen using snowball sampling, working from the household level up through the supply chain in two or three locations for each district. A sample of local government officials (district

-

¹ Muong Ang town, Xuan Lao, Ang Nua, Muong Lan and Nam Lich

agencies, subdistrict head and sanitarians) was chosen based on purposive sampling to include a cross-section of relevant key informants.

2.2.3 Data collection tools

Data collection tools (in the form of questionnaires) were developed for each of the following groups: villages, masons, materials shops, local government officials, transport providers and credit providers.

For the purposes of the research, three government (VIHEMA) approved toilet types were investigated. These were ventilated improved pit (VIP) latrines, double-vault latrines and septic tank latrines (see Figure 2).







Figure 2: Variations in toilet models – from left to right: VIP latrine, double vault latrine and septic tank latrine

Data collection tools are available in Appendix 1.

2.2.4 Data Analysis

The data collected was used for value chain mapping, i.e. a visual depiction of the sanitation hardware supply in the two districts. A value chain map of the sanitation hardware supply in Vietnam illustrates the way the sanitation related products flow to end users from producers and presents how the market functions. It is a compressed visual diagram of the data collected at different stages of the value chain analysis and supports the narrative description of the sanitation hardware supply-chain.

To allow interactive information and to create multiple perspectives on the value chain map, the value chain mapping of the sanitation hardware supply in Vietnam was conducted using geographic information systems (GIS). Google Earth was used as the base layer for GIS mapping, with additional information such as administrative boundaries overlaid on to this.

Implications for: (i) local, provincial and national government; (ii) CSOs/NGOs working to support enterprise development, may be drawn out concerning how to ensure access to affordable sanitation products for the poor.

In addition to the value chain mapping, qualitative data collected from the questionnaires with various groups are included as supplementary information, providing additional context to the complex situation regarding the sanitation supply chain.

2.2.5 Limitations

Data collection occurred across several phases in 2014, from initial scoping through to a more systematic approach as described in Section 2.2.2. The systematic approach aimed to overcome issues around data quality and consistency, however in reality, the data set for some aspects of the analysis was small, given the low populations at village level with latrines, and the small number of supply shops from which to gather data. In addition, in some locations all three types of latrines were not always present, particularly septic tank latrines, which were present in fewer numbers compared to other latrine types in remote locations. When this was the case, standard quantities and costs of materials were used to estimate how much it *would* cost to purchase materials for each latrine type in the village. As such, specific values at each data point should not be relied on too heavily, rather, we draw attention to the bigger picture across a district to provide an overarching view of value chain challenges in rural and remote settings in Vietnam.

3 FINDINGS IN MUONG ANG

3.1 DISTRICT OVERVIEW

Across Phase 1 and 2 of data collection, data was collected for 15 villages in Muong Ang District, including Muong Ang town, some remote villages, some commune centres and some villages in-between. Figure 3 shows Muong Ang district with its nine communes and Town Centre, with the locations for which data was collected also marked. The names of the nine communes and commune centre are seen on the map while roads through the district are seen as darker black lines.

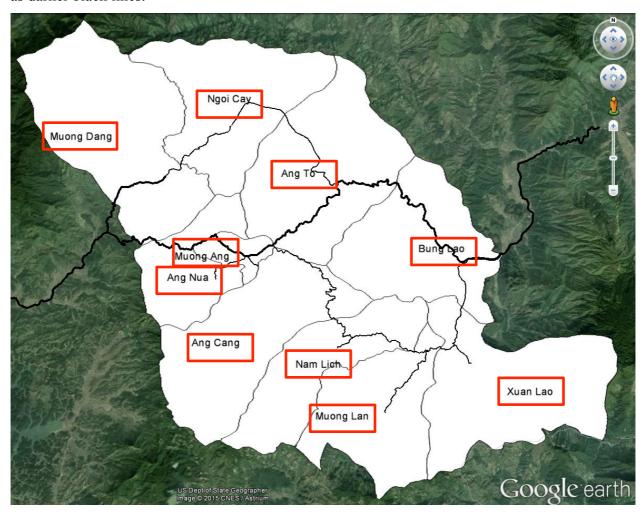


Figure 3: Data collection locations for Muong Ang District

Road access to many villages was difficult and dangerous, particularly during the wet season where some roads become inaccessible. Within some villages, paved concrete roads were in good condition; however the access through the surrounding mountains made transportation difficult (see Figure 4).



Figure 4: Variations in road access to villages in Muong Ang District (Bung Lao – left and Xuan Lao – right)

3.2 POVERTY AND ACCESS TO SANITATION

Key population parameters, including poverty rates and hygienic toilet coverage, for each commune in Muong Ang District are shown in Table 1. Communes with high poverty also have low rates of hygienic coverage, as shown in Figure 5. Qualitative data from interviews with households indicated a higher proportion of VIP latrines (many self-built), with decreasing proportions of double-vault latrines and septic tank latrines (which were found in fewer numbers) in Muong Ang's villages.

Table 1: Mường Ẩng District key parameters by commune

Commune	Population	Number of households	Poverty rate (%)	Hygienic toilet coverage (%)
Muong Ang town	5282	1725	7.9	-
Ang Cang	6675	1357	51.7	13.5
Ang To	5338	1082	44.4	18.5
Ang Nua	3442	771	31.6	25.4
Bung Lao	5372	1152	39.8	38.3
Xuan Lao	4821	928	56.6	11.9
Muong Lan	3972	773	62.8	8.8
Nam Lich	2791	510	65	14.1
Muong Dang	3472	714	52.3	10.6
Ngoi Cay	3092	614	55.7	9.4

Sources: Dien Bien Centre for Preventive Medicine (CPM) and CRES, Vietnam National University

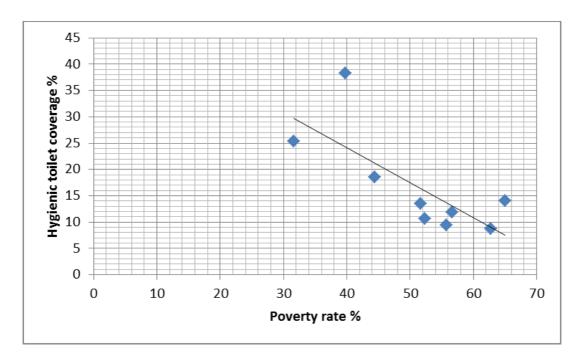


Figure 5: Poverty and toilet coverage by commune for Muong Ang District

Source: CPM and CRES

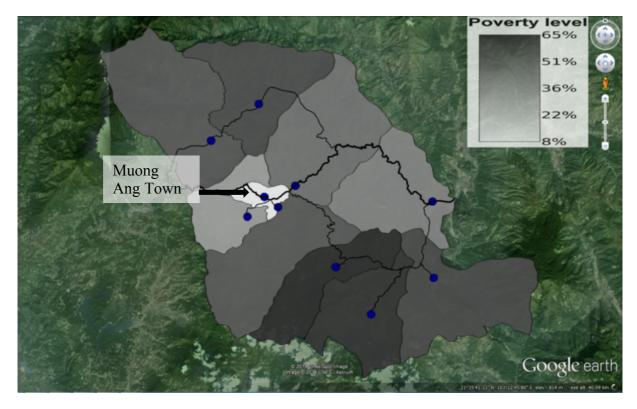


Figure 6: Poverty rates across Muong Ang District

The geographic coverage of poverty is shown in Figure 6, which shows poverty rates averaged by commune. Some communes further away from Muong Ang Town, the district capital, are seen to have higher rates of poverty. Figure 7 depicts averaged hygienic toilet coverage for communes across the district. Communes further from Muong Ang Town are also seen to exhibit lower rates of latrine coverage. One slight outlier was the commune of Bung Lao in the east of the district, and this result is explained by the location of this

commune along the main road, with easy access to materials from the local materials supply shop.

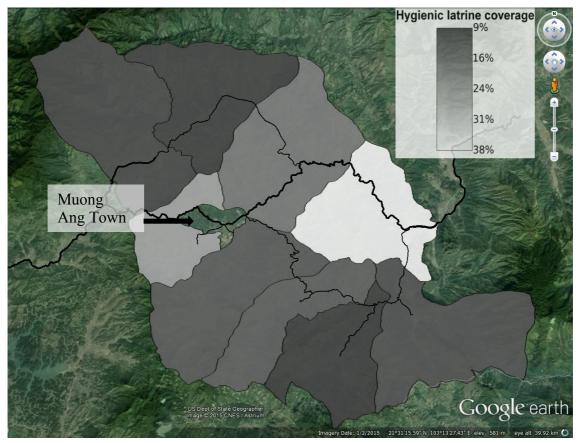


Figure 7: Hygienic toilet coverage in Muong Ang

The next three figures (Figure 8, Figure 9, and Figure 10) show costs of latrine prices (in local currency, Vietnam Dong - VND) for the three approved toilet types for each of Muong Ang's communes. Costs are provided for the locations where data was collected (i.e. not averaged costs). For all three toilet types, costs for more remote locations, and those further from the district capital, are higher.

Combining the underlying messages from Figures 6-10, results show that more remote communes (and villages further from the roads) correspond to:

- Higher poverty rates
- Lower hygienic latrine coverage
- Higher costs for the three types of approved latrines

The relationship between poverty rates and toilet costs in Muong Ang's communes for the three toilet types are also shown in Figure 11. What can be seen is that communes with high poverty also have a higher cost for all three toilet types.

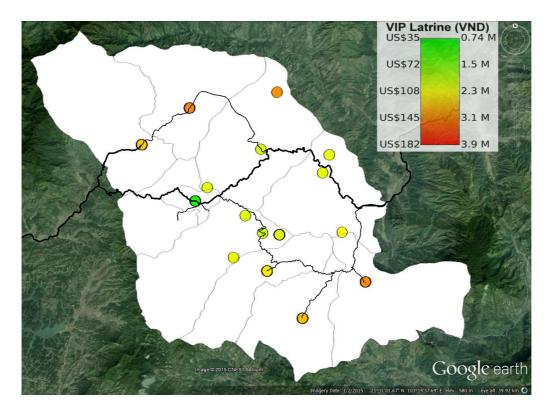


Figure 8: VIP latrine costs in Muong Ang District

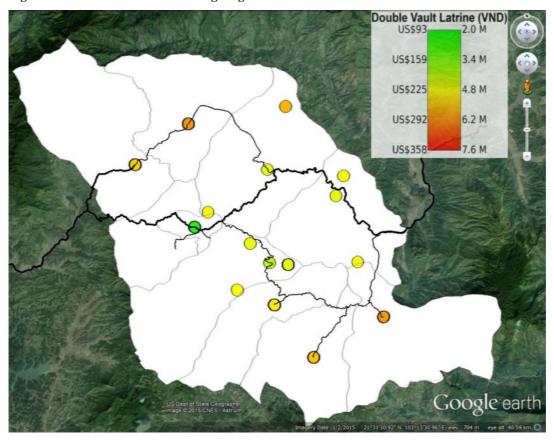


Figure 9: Double vault latrine costs in Muong Ang District

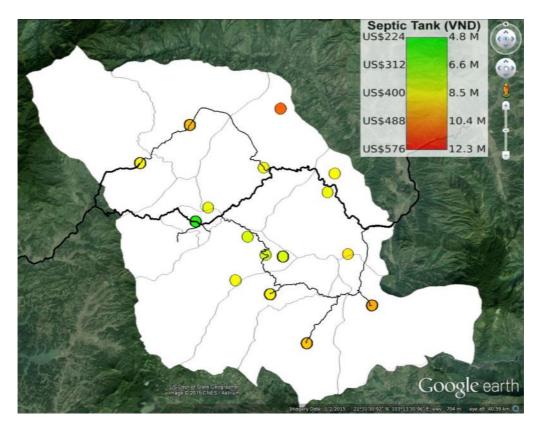


Figure 10: Septic tank latrine costs in Muong Ang District

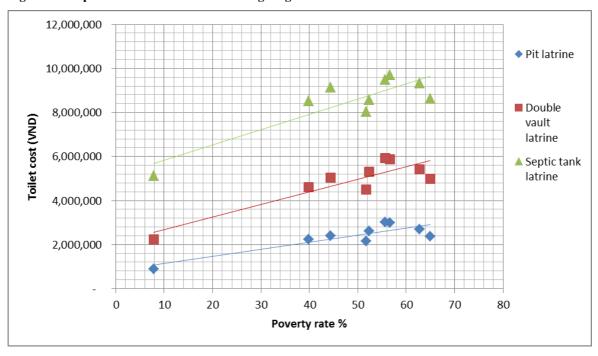


Figure 11: Poverty rates and toilet costs for Muong Ang communes

3.3 COST BREAKDOWN OF A TOILET

In this study, toilet costs were comprised of the cost of materials used to build the toilet, the cost of transport (sometimes included in material costs) and lastly, the cost of labour.

The cost of materials depends on the quantity of materials used and the per unit price. Standard quantities of materials for each toilet type, drawn from government (Ministry of Health), were set to ensure differences in the toilet cost are not simply due to the differences in the quantity of materials used.

The standard quantity of materials used for the three toilet designs in this value chain analysis is presented in Table 2.

Table 2: Standard quantity of materials used for the three toilet types

Materials	VIP Latrine	Double Vault Latrine	Septic Tank
Bricks (units)	300	1000	2700
Cement (kg)	100	200	200
Iron (kg)	6	15.5	31
Toilet pan (units)	N/A	N/A	1
Roof tile (units)	4	4	4

Source: SNV Vietnam, based on Ministry of Health standards

The costs of materials for each toilet type in Muong Ang Town are provided in Figure 12.

The breakdown of the proportion of the main material costs are provided in Table 3. It shows that bricks comprised the largest proportion of the cost for all toilet types; up to 71% for the septic tank latrine.

Table 3: Proportion of costs attributed to main materials in Muong Ang for three toilet types

Type of toilet	Cement	Bricks	Iron	Roof tile	Toilet pan
VIP latrine	15%	46%	19%	20%	n/a
Double vault latrine	12%	61%	19%	8%	n/a
Septic tank latrine	5%	71%	17%	3%	3%

The weight of materials for each toilet type, using the standardised quantities from Table 2, was important in considering transportation costs, as truck based transport providers charge by weight. Furthermore, when truck based transport was not possible to reach more remote locations due to the conditions (or lack of) roads, households transport materials themselves using motor bikes. For this form of transport, weight also determined the number of motor bike trips required to transport materials from retailer to household (see Section 3.5 for details).

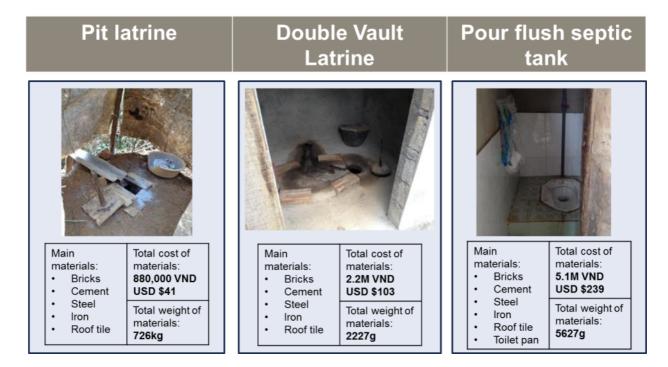


Figure 12: Cost and weight of materials for three toilet types in Muong Ang Town

The cost of labour was calculated for each toilet type as follows:

- VIP latrine: 1M VND (USD 47), equating to approx. 5.5 labour days
- Double vault latrine: 2M VND (USD 94), equating to approx. 11.5 labour days
- Septic tank latrine: 2.6M VND (USD 122), equating to approx. 15 labour days

These labour costs are based on the rates for masons (drawing on data collected from the field) and the estimated time taken to build each toilet type. Master masons labour rates are approx. 200,000 VND / day (USD 9.40), while mason assistants charge approx. 150,000 VND/day (USD 7.00).

For VIP latrines, in most locations in Muong Ang district, material costs are less than costs for labour (material costs are approx. 80 - 90% of labour costs). For double vault latrines, labour costs less than costs for materials: materials are 10% higher than labour for the former and double the cost of labour for the latter.

3.4 MAIN ACTORS, PROCESSES AND LINKS IN THE VALUE-CHAIN

3.4.1 Key actors in the value chain

The key actors in the value chain include:

- Materials supply shops retailers at provincial, district and local levels
- Masons available in all villages. Masons usually work in teams consisting of a Chief Mason, a Skilled Mason and Assistant Masons. They build any type of construction, from houses, roads, fences, pig sties and latrines.
- Transport providers available in district centre and some commune locations, often as a combined business with materials supply shops
- Local producers cement blocks, bricks, sand and stones

3.4.2 Product-specific supply chains

This section provides a description of two supply chains (cement and toilet pans) while the next section includes information about costs and earning profiles along these two supply chains.

Cement

In Dien Bien Province, including in Muong Ang District, the most popular cement used for toilet construction was 'Dien Bien Cement'. The cement was manufactured in Dien Bien Cement Factory (in Dien Bien Phu town) and distributed to its agencies in the districts (see Figure 12). From its agencies, the cement was transported to retail construction shops located both in district town and commune capitals. The factory was responsible for transportation (including transportation costs) to its agencies. Transportation costs from the agencies and retail shops to households are borne by the customer. The factory did not allow wholesale to household customers given the small quantities required. Figure 13 illustrates the cement supply chain in Dien Bien, with the arrow denoting where households can skip elements of the value chain to save on material costs, as they currently do when they purchase from district retailers. Transport costs are then borne by customers (see Section Error! Reference source not found. for further details). Figure 14 provides images of the Dien Bien Cement, and one of the retailers selling it in Muong Ang Town.



Figure 13: Cement supply chain in Dien Bien





Figure 14: Dien Bien Cement sold by a local retailer in Muong Ang Town

Toilet pans

Toilet pans were generally purchased by retailers from companies and manufacturers in the region surrounding Hanoi, including Thai Binh Province (approx. 500km away, see Figure 15) which produced toilet pans purchased by one of the retailers interviewed for this study. In Muong Ang District, one of the most significant costs involved in toilet pan purchase for locations outside the district centre was transport (see Section 3.5).

Results indicated that households paid more attention to the price than to brand name for toilet pans. When asked about which type or brand name their toilet pan was, no householders could remember. Most households preferred a squatting pan for several reasons, including the lower price, it being easier to clean (they believed it is difficult to keep the seated pan clean) and to use (they believed the flush lever on seated pans is often broken).

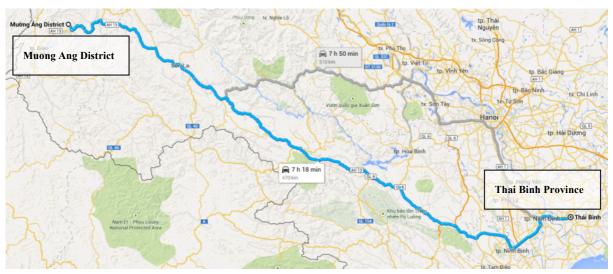


Figure 15: Toilet pans are produced in Thai Binh and transported to Muong Ang, nearly 500km away

3.4.3 Locally sourced materials

Sand and bricks were usually sourced locally. Having easy access to locally sourced materials was found to significantly reduce the cost to a household. More details are provided below on locally sourced bricks and sand.

Bricks

There were some brick factories in Muong Ang District that produced red bricks used in building latrines (see for example, Figure 16). Households could buy bricks directly from the factories, from construction retail shops or could purchase by ordering from truck transporters. One brick maker noted the raw materials used to make his red bricks were sourced from the rice paddies, and his factory produced 6000 bricks per day.

Sand

In Muong Ang, sand can be exploited locally. Furthermore, the quantity of sand required for building toilets is relatively small; therefore households who combine building a toilet with building other schemes (e.g. bathrooms, houses) did not pay close attention to costs sand for toilets. Those who are building a standalone toilet were able to source the small amount of sand they needed informally from within their village at negotiated costs, and thus costs for sand are not included for Muong Ang toilet costs.



Figure 16: Locally made bricks from a factory in Muong Ang

3.5 COSTS, EARNING PROFILES AND FINANCIAL PERFORMANCE OF DIFFERENT LINKS

3.5.1 Cement supply chain

As noted above, cement was produced locally in Dien Bien Phu, the provincial capital, which was relatively close to Muong Ang (approximately 50km, or 45 minutes driving). Cement at the factory was sold for 135,000 VND (USD 6.32) per 100kg.

In Muong Ang Town, cement was sold for 145,000 VND (USD 6.79) per 100kg for small quantities and 142,000 VND (USD 6.65) per 100kg for large quantities. It was found that the supply chain for cement was optimised in that low profit margins were accepted by supply shops in Muong Ang town. The business owners reported rapid turnover of cement, since it was a commonly used construction material. One supply shop in Muong Ang Town reported a turnover of 400 tonnes per month of cement and daily deliveries, making a 7% profit for small purchases and 5% profit for larger purchases.

While cement was often available in the commune centres across Muong Ang District, costs were higher, particularly for the more remote communes. For example (and as shown in Figure 17), an Ang Cang retailer was relatively close to the commune capital and sold its cement for an additional 5,000 VND (USD 0.23) per 100kg when compared to the district capital cost. In Bung Lao, the retailer added an additional 35,000 VND (USD 1.64) per 100kg

and in the more remote Ang To commune, and additional 45,000 (USD 2.11) per 100kg was charged when compared to district capital costs. This is also depicted in Figure 18.

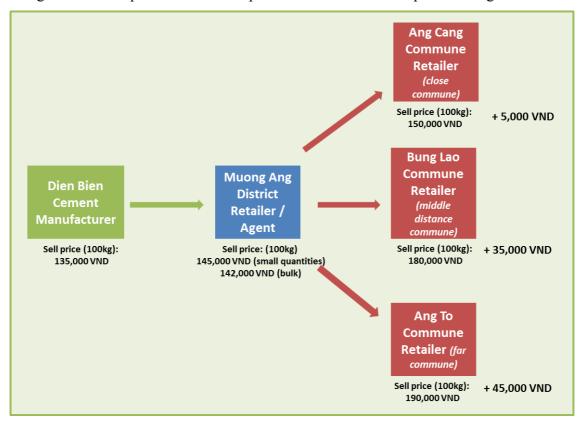


Figure 17: Cement costs from Dien Bien Cement factory to commune centres in Muong Ang District

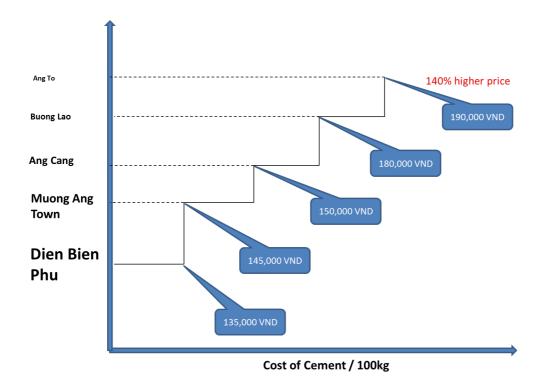


Figure 18: Cement prices from Dien Bien Phu to more remote communes of Muong Ang District

3.5.2 Toilet pan supply chain

At the district level (in Muong Ang Town), the retail price of squatting pans in Muong Ang varied from 120,000- 370,000 VND (USD 5.60 – USD 17.30) while the price of a seated pan varied from 500,000- 1,400,000 VND (USD 23.40 – USD 65.50). Most customers preferred the squat pans for reasons cited in section 3.4.2.

Commune level materials store also sold some squat pans, with prices increasing with distance, as seen in Figure 19. There were no locally produced toilet pans in Muong Ang.

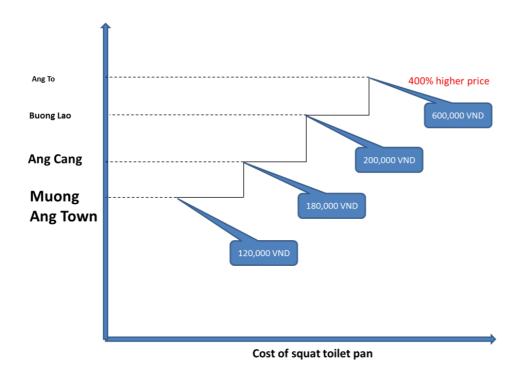


Figure 19: Cost of toilet pans from Muong Ang Town to more remote communes

3.6 INFLUENCE OF TRANSPORT AND ACCESSIBILITY

3.6.1 How households transport materials for sanitation

Due to the small quantity of materials needed for latrine construction (relative to building a house or other such project), most households interviewed preferred to transport the materials themselves with their personal / family motorbike. In isolated or remote villages, transport by motorbike is more popular because the roads are narrow, muddy, steep and slippery, such that trucks cannot access them. Transport cost per trip by motorbike (labour costs not included) is approximately 10,000- 30,000 VND (USD 0.47 – USD 1.40) depending on the distance from the shop to the household. If a household plans to build their latrine, they usually combine their reasons for travelling to buy materials with other purposes in the trips to the commune centre or district town. Using this approach, over time they gradually gather enough materials for their latrine. This approach makes calculating costs for privately arranged transport for latrines inherently difficult, given the opportunistic approach taken by households.

3.6.2 Logistical issues in transporting materials

Figure 20 illustrates the time it would take to transport, by motor bike, materials for a VIP latrine across the district. This time incorporates the multiple trips required to transport the quantities of cement, bricks, iron and roof tiles (with a total weight of 726 kg, as seen in Figure 12) from the point of purchase to the household. In this figure, which depicts Muong Ang District as a 1km grid, we assume motor bike can travel not only on the main roads (which are shown as dark thick lines), but also virtually access anywhere else along small tracks away from roads. This is a simplified version of reality, however in practice observations show that motor bikes are able to access most households across the district.

What can be seen is that for areas further away from the roads in the most remote locations, the time taken is the highest, adding to three full days of time, driving small, manageable quantities of materials from the point of purchase to the household. To dedicate this amount of time to such a task would require a high degree of motivation, as well as cost, as most householders work as labourers or farmers and three days transporting materials would equate to three days less wages, plus fuel costs.

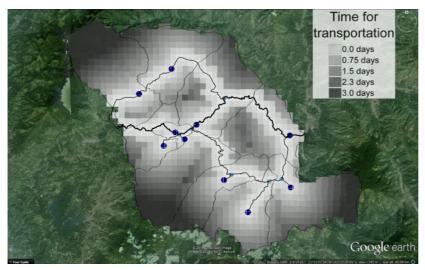


Figure 20: Time for transportation of materials by motor bike for VIP latrines beyond commune centres in Muong Ang District

Transport providers and other interviewees also noted the difficulty in delivering materials beyond the commune (or sometimes village) centre. For example, it was noted that in Xuan Lao commune, "There is a total of 20 villages. 17 have paved road to centre of village. Three do not and can only be reached by motor bike... The reason is the road is narrow..." One mason interviewee provided an example of the difficulty in working in remote locations as a result of the access challenges:

"Last year, I received three orders in Nam Lich for septic tank latrine. But it was too far to transport the materials so I had to refuse these customers. The only way to bring material to that household is by motor bike. In most towns you can carry 100 bricks - maximum you can carry to that village is 30 bricks. Only the households who live in centre of commune get septic tanks."

In the situation described above, if a customer in the Nam Lich village above had gone through with constructing a septic tank latrine, a motor bike would need to undertake 90 trips just to transport the 2700 bricks required. Considering the fuel and time costs associated with such a

task, the barriers to constructing this type of latrine in remote locations are obvious. These issues are also illustrated in Figure 20.

3.6.3 Formal transport operators

Some households do opt to use formal transport operators for the delivery of latrine and other construction materials. The number of transport providers has increased in Muong Ang district over recent years; with one provider estimating 100 trucks were currently servicing the area. Despite the increase in competition, truck drivers were still able to make considerable profit per trip, although their profit margins and total profits did appear to be decreasing with the growing number of transport businesses in the area (e.g. reportedly 5-7 million VND (USD 234 – USD 328) in profits per month, compared to 10 million VND (USD 468) per month 2 years ago). The current cost of a 2.5 tonne was reportedly 200 million VND (approximately USD 9,500) and this amount was able to be paid back over a 2 year loan period, as noted by a Muong Ang transport provider.

3.6.4 Profiles of typical transportation business types

Since transport adds significant cost within the value-chain, it is important to understand its status, the level of competition at different levels (province, district, commune) and opportunities to reduce transport costs. The following table provides profiles of two transport providers in Muong Ang Town.



This transport provider's business was small (one 2.5 tonne truck) and unregistered. The main customer base was across Muong Ang District. The owner had an agreement with a local supply shop to deliver their goods, guaranteeing him a level of customers. 30% of his customers came through the shop, while 70% were from his own private business.

For privately arranged transport (i.e. unrelated to the supply shop), prices are negotiated between the customer and the transport provider, who noted "Prices depend on negotiation with the customer. This means how well you know the person. It is a bargaining process." Households in more remote villages were required to pay in cash on delivery of materials, whereas the transport provider accepted credit for households closer to the commune capital.

The transport provider also works for a construction company and was able to balance work between the two roles.

The transport provider noted that while he often provided discounts to poor customers, he was sure to never make a loss: "We have to cover our own costs. We don't charge labour [for poor customers] but we have to cover other costs like fuel".

Muong Ang Transport Provider 2

The second transport provider's customer base was mostly households was both within Muong Ang and also extended to Son La Province. His business relies on 'word of mouth' to extend his customer base. Like the first, he too had a second job in construction, as a labourer. In addition, he also worked in his materials supply shop, to which his transport business was



attached, and he owned a coffee plantation. It was the transportation business that he hoped to expand in coming years by negotiating with big companies and purchasing more trucks.

3.6.5 Profit margins in transportation businesses

Based on information collected from transport provider interviewees, the Table 4 compares the costs associated with the delivery of materials in 2.5 tonne and 3.5 tonne trucks from Muong Ang town to Nam Lich commune centre (approximately 12km away). The profit margins (calculated as net profit divided by selling price) were much higher than for any of the materials used to build toilets. Note that net profit does not take into account labour costs.

Table 4: Costs associated with transport businesses

Costs from Muong Ang to	2.5 tonne truck (Muong Ang	3.5 tonne truck (Muong Ang
Nam Lich	based Transporter #1)	based Transporter #2)
Delivery charge (VND)	550,000	1,500,000
Fuel Cost (VND)	200,000	300,000
Maintenance (VND, per trip)	56,667	166,667
Profit (VND, less labour costs)	293,333	1,033,333
Profit margin (net profit divided by selling price, as above, less labour	53%	69%
costs, as above, less labour costs)		

An additional issue with transport providers is that their delivery of materials which they described does not account for a full time occupation. One transport provider also worked as a labourer for a construction company and drove the truck when there was no work available in labouring.

3.6.6 Materials costs versus transport costs

Figure 21 below shows the proportional costs of materials and transport for the three toilet types in Muong Ang's communes (note that labour costs have been excluded from this analysis, given consistent labour costs were estimated, independent of location). What can be seen is that transport costs comprise the highest proportion of costs for VIP latrine (over half the cost in some locations (56%), with an average 33%). For double vault latrines, the proportion is less (average 22% of materials plus transport cost) and least for septic tank latrines (up to 28% of the cost, with an average of 14%).

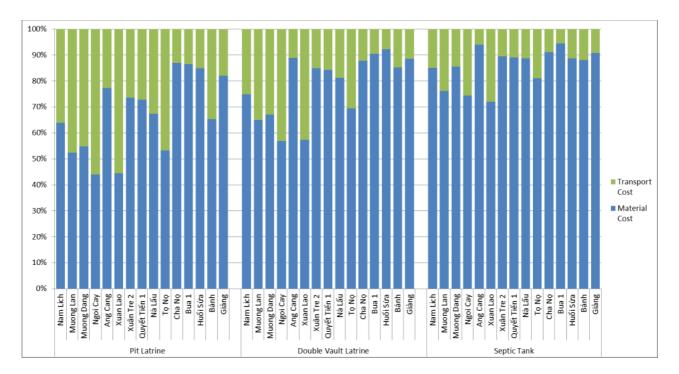


Figure 21: Proportion of costs of materials and transport for three toilet types across Muong Ang district
This data is also displayed geographically in the following three figures, highlighting that for
the more remote locations, transport comprises a higher proportion of total latrine costs.

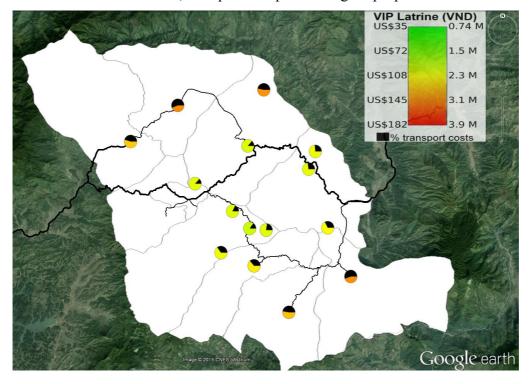


Figure 22: VIP latrine materials and transport costs

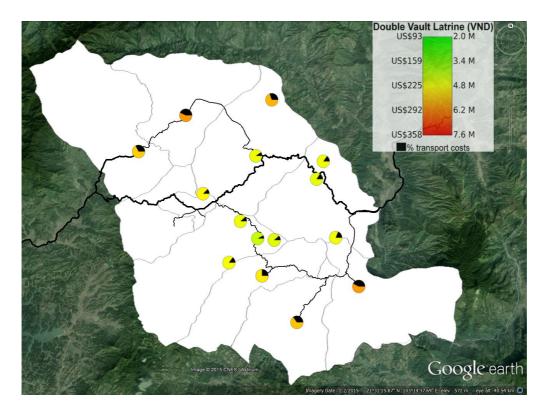


Figure 23: Double vault latrine materials and transport costs

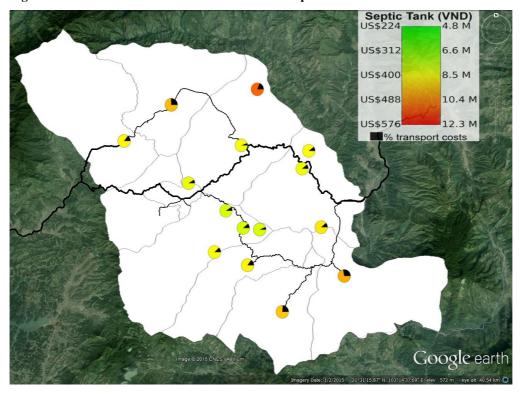


Figure 24: Septic tank latrine materials and transport costs

As noted in Section 3.2, VIP latrines comprise the highest proportion of all latrine present in Muong Ang, with many described as self-built. Reasons for this are they are simpler to build (can be built by householders themselves), require fewer materials so easier to transport, and are overall the cheapest of the three options. Despite these more favourable qualities of VIP

latrines, the proportional cost of transport is higher than for other toilet types, adding significant cost, and therefore barriers, to already financially stretched households.

The actual costs of transport and materials for the tree latrine types across Muong Ang's communes are seen in Figure 25. Given the high poverty rates in Muong Ang, this figure highlights how the high costs of septic tank latrines mean they are out of reach as an affordable option for many households.

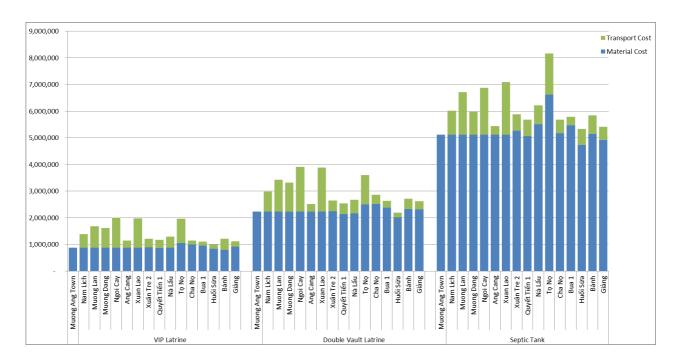


Figure 25: Actual costs of materials and transport for three toilet types across Muong Ang district

3.7 OTHER FACTORS AFFECTING CRITICAL LINKS IN THE CHAIN

Qualitative information about the supply chain revealed the importance of relationships, particularly in how, and the degree to which, they can access credit to purchase sanitation materials. Qualitative information also revealed the importance of road accessibility as a factor influencing the supply chain. This was supplemented by additional quantitative information. Both these factors are explained below.

3.7.1 The importance of relationships

The relationships between suppliers and customers were important for how the supply chain operated. This was especially important with respect to transport providers, who displayed a high level of discretion about their profit margin and negotiated different rates for different clients. For example, one transport provider noted that to transport materials to Xuan Lao (a commune in Muong Ang), it "costs over 1M (VND) to get there but depends on negotiation with the customer. This means how well you know the person. It is a bargaining process." A shop owner also commented on the nature of relationships with her regular transport provider: "If you get the service from others [transport providers], its higher price. It depends on the relationship."

Relationships between shop owners and customers also had a strong influence on the customer's access to credit – the better the relationship between the two, the more credit was offered. Supply shops offered credit to a large proportion of their customers, which is likely to increase access to products by the poor. For example, one shop owner noted "For the poor households, we have a discount. Even for small value items, we give it free to them." Another shop owner noted that "80% of customers buy in credit. We ask them to pay back as soon as possible. They promise to pay back. We take their details - we have a book and when they come to buy, the quantity of materials is written down." For credit repayment, terms between the supplier and the customer were loose and it was generally expected that debts be repaid before the lunar New Year each year.

3.7.2 Demand and affordability

Low demand at the commune centres is not due to limitations in availability in the supply chain, as materials are available for both sanitation specific materials such as toilet pans, as well as for materials to construct latrines such as cement and steel, which are also (and primarily) part of the construction business. However materials may be expensive, depending on the commune (as this research has revealed), and affordability, or perceived affordability, directly affects demand. Issues of low latrine uptake are also linked to certain ethnic groups (see Rheinländer et al. 2010). One shop owner noted that historically, only Kinh people bought latrine pans, but over the past few years, Thai people have begun purchasing septic tank latrines and pour flush pans. This owner also noted that "People in urban areas prefer sitting latrine pans. In the mountains and remote areas, they prefer pour flush. It also reflects their economic conditions" and this comment was repeated by another shop owner. Furthermore, both also shop owners noted that local sales of coffee were high last year, and correspondingly, a higher than average number of toilet pans were sold as households were able to afford them.

Low demand at village level, away from commune centre, is likely to be due to several factors, in addition to those present at the commune centre. One of the additional factors is the physical barrier in transporting materials to villages without paved roads big enough for any vehicle other than motor bikes. Motor bikes can transport items like bags of cement, however many multiple trips (15 trips for VIP latrine, 40 trips for double vault latrine and almost 100 for the quantity of materials required for a septic tank) deem this approach impossible for most people. The associated monetary cost of transport is another barrier. Even for remote villages where trucks can access, the cost of transportation can be almost as much as the latrine materials, leading to a doubling of the price of a latrine that would be paid at the district capital.

Finally, households in remote villages had limited awareness of the types of affordable sanitation options that were available. Cases of wealthy households building expensive septic tank latrines with adjoining bathrooms provided poorer households with the only example of what hygienic sanitation looked like. This meant poor households had an incomplete picture of what hygienic sanitation included. Local government and CSOs, together with Women's Union staff could therefore work to raise the understanding of poor, remote households of the various more affordable types of sanitation that are available (e.g. VIP and double vault latrines).

3.7.3 Characteristics of materials supply shops

Supply shops were often family run, with the larger shops having formal registered status as enterprises and smaller shops being informal businesses. Shops in Muong Ang Town and some communes were aware of other nearby competitors but none went to any lengths at deliberately marketing their products, instead relying on their reputation such that their loyal customers would recommend them to others, and make return trips. The majority of supply shops accepted credit as a form of payment and many noted that they were forced to do so as their customers were poor and unable to pay the full cost upfront. The terms of credit were negotiated and dependent on the trust and strength of the relationship.

Size, age, and formal legal status

The supply shop businesses in Muong Ang town interviewed for the research were family run, with husband-wife teams and some children participating in the operation. One shop owner noted it was a tradition for the family to run this style of business – however before, the owner's occupation was selling pork at the market, the proceeds of which were invested in establishing the supply shop and building the family home. A loan from a bank was still needed, and the owner noted that "When I took this loan - I lost weight! [laughs] I was so worried - wondering if I could do business and pay it back [laughs]. Now I am ok, and I can borrow 2 billion VND (USD 93,800) and not worry so much".

The supply shops interviewed in Muong Ang town had formal legal status as an enterprise. While not a government requirement, being classified formally as an enterprise meant the business could supply a "red invoice" to customers, a formal receipt required by larger companies as proof of purchase. The alternative was to be a small unregistered shop, which was legal but unable to provide red invoices thus missed larger business transactions. Some other commune level shops did prefer this as it was simpler in terms of tax reporting.

Shops were required to pay environmental tax, VAT (10%), the business tax and income tax (at the end of the year based, on turnover). Income tax is only required for established enterprises operating for over five years.

Marketing and competition

Supply shop owners did no marketing of their shops or products (see Gero and Willetts, 2014 for details). One owner noted "There's no marketing. Customers they decide to come. We have a relationship and they [customers] see our prices are appropriate - they come here." When asked about plans for the future, another shop owner said "I'm getting older so I don't want to expand - I want to narrow it."

Despite not undertaking any marketing activities, shops were aware they faced competition. One stated that "of course all businesses have competition. It depends on the art of selling. My shop is based on the price I buy - I decide the selling price that will attract customers. I don't know if my price is cheaper. I am sure that if there is a variation it's not too much."

Credit and discounts for customers

Material supply shops in Muong Ang town accepted credit as a form of payment, noting that most of their customers were poor so often did not have the total purchase amount at the time of sale. One shop owner added "It depends on the customers [in terms of] who is offered credit. I have information on customers - this helps decide who gets credit." The selling price was also dependent on who the customer was, the relationship the shop owner had with the

customer, the quantity of materials, and whether or not they paid in cash, which can lower the price.

Chasing up credit repayments from customers was difficult for the business owners, with one noting "Some enterprises - they bought materials here 340M VND but up for to 4 years later they pay nothing and they become bankrupt." The timing of credit repayments depended on the customer, with government staff usually paying at the end of the month; farmers at harvesting time and for other households who have family members working outside, they pay during Tet (Lunar New Year) holiday when family come back to the village. When asked what the biggest challenge the business faced, one shop owner replied "Selling in credit and not getting it back."

Some shops were open to providing discounts for poor customers, with one noting "For the poor households we have a discount. Even for small value items, we give it to them for free."

Transport

Some material supply shops had their own trucks for customer deliveries, while others had established relationships with transporting businesses and sub-contracted the delivery (and labour associated with loading / unloading of materials) to them. Prices were always negotiated between the shop owner and the transport operator.

3.7.4 Forms of credit for small businesses

Business owners of supply shops selling construction materials used for sanitation were accessing loans, for example from the Vietnam Bank for Agriculture and Rural Development. An example revealed that one business was granted a loan from the Bank based on the owner's complementary agricultural business, which was productive and profitable, despite intending to use the loan capital for their supply shop.

One business owner who took out a loan noted how relatives can also provide assistance for loan repayments: "Every month, I have to pay interest. At the end of the loan, I have to pay the capital. At that time, you can borrow from a relative and pay the capital back. Then a few days later you can borrow again."

Despite accepting credit as a form of payment from customers, shop owners had to pay their own suppliers in cash. This restriction of cash flow proved to be a barrier for businesses taking loans and expanding their business. As a result, some shop owners were becoming reluctant to offer credit to their customers

3.8 INFLUENCE OF CURRENT GOVERNMENT POLICY AND REGULATORY FRAMEWORK

At the national level in Vietnam, the Ministry of Health (MoH - specifically Vietnam Health Environment Management Agency (VIHEMA)) has formal authority for planning, monitoring and implementation of rural sanitation, including household latrines (Gero and Willetts, 2014). The government's "Decision 131" of 2009, issued by the Prime Minister, provides a framework and incentives (e.g. access to land, access to soft loans and tax breaks) to support to eligible enterprises, including those operating in rural water supply and sanitation (MARD, 2013). However, our earlier research found that private sector find the loans hard to access and only available at high rates (Gero and Willetts, 2014).

At the provincial level, the responsibility for allocating funds for water and sanitation is through the Provincial People's Committee, the Department of Finance and the Department of Planning and Investment. The Provincial Centre for Rural Water Supply and Environmental Sanitation (PCERWASS) acts as the Standing Committee for water and sanitation and has significant power in allocation of budgets and attention to related issues.

Challenges the government faces in supporting the development of the private sector (which has implications for the supply chain) were previously identified by Gero and Willetts (2014: 28), and key challenges are provided below:

- Lack of formalised government policy regarding the support of private enterprise, as noted by a government interviewee: "So far we don't have the policy to support private sector in rural areas"
- The difficulties government faces in directly supporting private enterprise (e.g. NTP funds cannot currently be used to train masons or to provide suppliers with business training)
- VIHEMA realises that the market based approach is valid, but reported that they have limited experience in implementing it
- There are many elements of private enterprise engagement that the government could support, and government needs to decide which is best e.g. technical support and training, enabling environment, tax incentives etc.
- Decentralised government means that provincial- and district-level governments must also be convinced to support the private sector, as many decisions are made at subnational level
- Some communities are unwilling to pay for previously subsidised or free services. National government agencies were cognisant of the challenges associated with engaging with the private sector, and are partnering with NGOs, UNICEF and others (e.g. WSP) to pilot approaches and learn by trialing a range of approaches.

At the local level, Commune Peoples Committees (CPCs) had varying degrees of support for private enterprise. As noted in Gero and Willetts (2014:31): "Despite national government support for private enterprise, sub-national government was not always willing to engage with businesses. This has strong implications for how enterprises can operate at the local level." The subnational governments that did support the private sector approach had generally worked with NGOs (such as SNV) on, for example, demand creation activities. Provincial CPM in Dien Bien (who had engaged with SNV on sanitation activities) interviewed for this research actually noted that, in terms of support to private enterprise, "I think we should focus on communication and education [for households]. Even the better off households, they have not built a latrine. So it's not economic conditions [that limits hygienic latrine uptake], it's awareness."

In locations where CSOs had been working, the mass organisations (such as Women's Union, Farmer's Union) were also often active. Mass organisations can be effective in sanitation promotion, which can in turn support businesses associated with sanitation products and services and stimulate the supply chain.

Another way governments could influence the sanitation supply chain was through financially supporting banks for specific types of loans to businesses. However, this can have unintended negative consequences. One supply shop owner in Muong Ang noted how the government underwrites 50% of the interest rate on a bank's loans for productive purposes. Enterprises could access the loan for purpose of production at favourable interest rate – with little

attention paid to whether or not the loan was used for "production", or something else (such as supporting or expanding a retail business). The shop owner noted that:

"The Director of this bank makes money from this policy. He gave it to many enterprises who couldn't meet the standard. Later this was discovered and now he is in jail. A lot of enterprises were punished to pay [the money] back. If this happens, enterprises will be bankrupt. So a lot of enterprises buy in credit."

In this instance, enterprises accessed the loan for reasons beyond production and had trouble paying the money back. Furthermore, caught up in this was the fraudulent conduct by the bank manager who encouraged business owners to take up the loan. More stringent government policy could help to negate such circumstances occurring again.

The most obvious ways that government could support the supply chain are unfortunately not viable as the targeting cannot be limited to latrine construction. For instance, subsidies to either supply shops or to transport operators would inadvertently subsidize non-latrine construction, since the materials used for latrines are common construction materials.

One option to target latrine construction involves subsidies to targeted households, and would require verification of its use for latrine construction. For this reason 'vouchers' are currently under experimentation in various country contexts, that support poor households to purchase materials from certain shops at reduced (or no) costs. One further option is subsidies for alternate materials such as concrete rings, which are generally only used for latrine construction.

Another option is readily accessible and targeted (i.e. for sanitation) loans for poor households at affordable rates from financial institutions such as the Vietnam Bank for Social Policy (VBSP). While VBSP at the national level have noted their commitment to provision of such loans - specifically for water and sanitation, our previous research has highlighted this has not always led to loans being taken up at the local level (see Gero and Willetts, 2014). Greater levels of uptake were found when mass organisations (e.g. the Women's Union) played a facilitation role between VBSP and the household.

4 FINDINGS IN MAI CHAU

4.1 DISTRICT OVERVIEW

Data was collected for 14 locations (villages, commune centres and Mai Chau Town) across Mai Chau district, which has 23 communes. Figure 26 shows Mai Chau District, highlighting the locations for which data was collected.

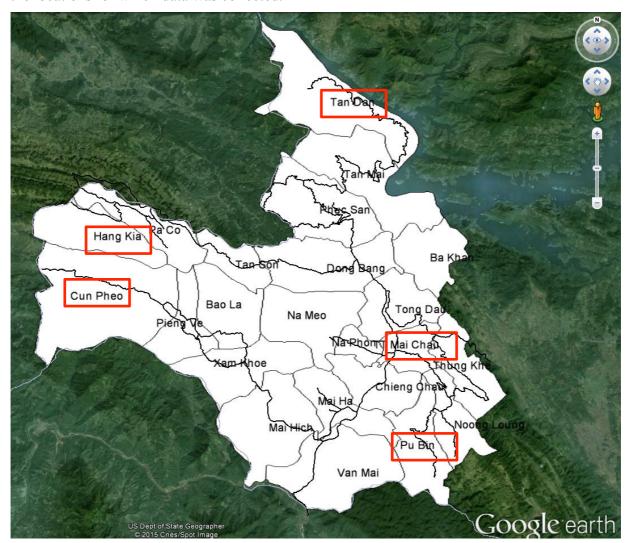


Figure 26: Mai Chau district and communes (highlighting communes where data was collected)

Access to these locations is noted in Figure 27, highlighting the difficulty (pink = most difficult, yellow = medium difficulty and green = easy access) in reaching villages further from the district and commune centres.

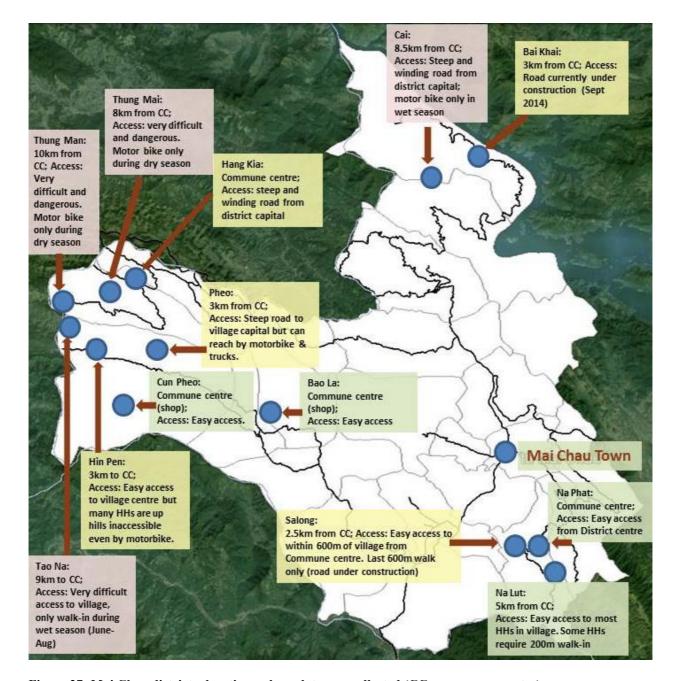


Figure 27: Mai Chau district – locations where data was collected (CC = commune centre)

One limitation worth noting here is the inaccuracy of the road network, which in reality is different in some locations to the maps shown. For example, Cun Pheo looks to be far from a main road (this was not the case), and Thung Man village in the west of the district appears to be located on a road. In reality, the latter village is a difficult 10km along a difficult and dangerous road. Examples of difficult road access are seen in Figure 28 below which shows roads in Hang Kia commune to Thung Man village (left) and Thung Mai (right) – only accessible by motor bike in the dry season.





Figure 28: Difficult road access to villages in Hang Kia commune

Tao Na village lacked any constructed latrines at all, with temporary pits (called a "bridge pit") most common. This data is inconsistent with local CPM data which notes the presence of different types of latrines present in these villages.

4.2 POVERTY AND ACCESS TO SANITATION

Key population parameters, including poverty rates and hygienic toilet coverage, for each commune in Mai Chau district are shown in Table 5. As for Muong Ang, communes with high poverty also have low rates of hygienic coverage (Figure 29). The same pattern of types of toilets was found in Mai Chau as for Muong Ang, i.e. households indicated a higher proportion of VIP latrines (of which many were self-built), and the district had decreasing proportions of double-vault latrines and septic tank latrines.

Table 5: Mai Chau key population parameters by commune (communes for data collection highlighted)

Commune	Population	Number of Households	Poverty rate (%)	Hygienic Toilet coverage (%)
Thung Khe	540	143	18.44	18.18
Pu Bin	1705	381	53.68	2.62
Pieng Ve	2354	574	30.84	11.85
Cun Pheo	2171	522	54.81	10.34
Bao La	2302	559	29.7	11.45
TT Mai Chau	5145	1217	3.06	80.94
Dong Bang	1353	360	12.2	35
Mai Ha	2632	671	17.82	13.86
Mai Hich	3658	898	16.23	12.36
Pa Co	2584	532	22.82	27.07
Ba Khan	1486	349	48.99	8.02
Phuc San	2234	510	41.99	18.63
Tan Dan	2072	545	58.65	4.04
Xam Khoe	2654	631	10.92	18.7
Tan Son	1059	273	27.51	19.78
Tong Dau	2751	703	7.67	25
Tan Mai	1564	369	45.73	8
Hang Kia	2695	574	42.23	4
Chieng Chau	3432	867	11.61	23
Noong Loung	1560	382	44.62	4
Na Meo	1360	335	49.4	6
Na Phon	1590	392	21.88	17
Van Mai	2296	740	14.17	40

Source: CPM and CRES

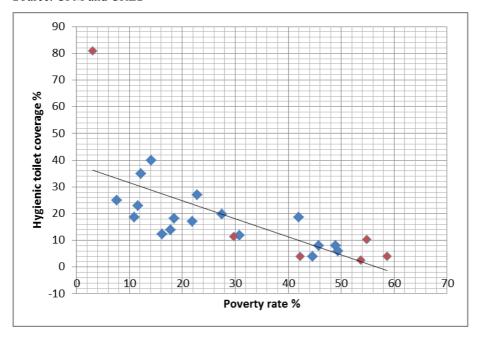


Figure 29: Poverty and toilet coverage by commune for Mai Chau District (red diamonds denote sampled communes)

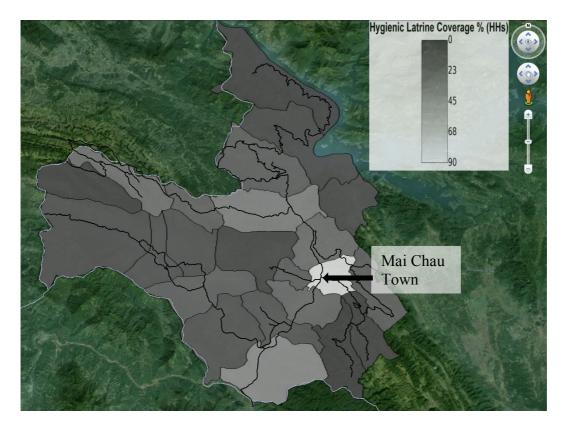


Figure 30: Hygienic toilet coverage in Mai Chau

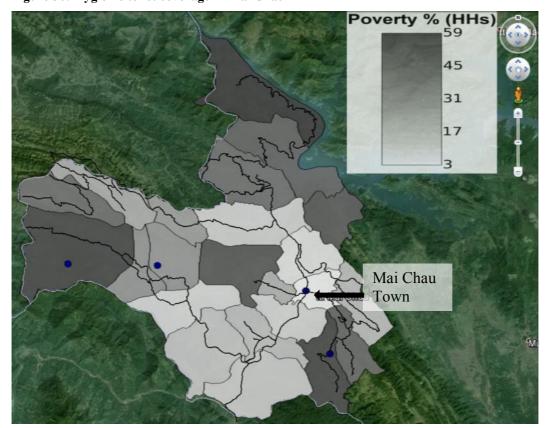


Figure 31: Poverty rates in Mai Chau

Costs for the three toilet types across Mai Chau district are shown in the following three figures. The pattern of where costs are highest are similar for all three latrine types, with

Thung Man, Thung Mai, Hin Pen, Tao Na and Cai villages having the highest costs. This correlates to access difficulty, as described in Figure 27.

Despite being some distance from the district capital, toilet costs remain low for Cun Pheo and Bao La, as construction material supply shops in these commune centres had low cost materials available, generally of lower quality than found in Mai Chau Town. There was also limited choice of brands available, with only brand available for each type of material.

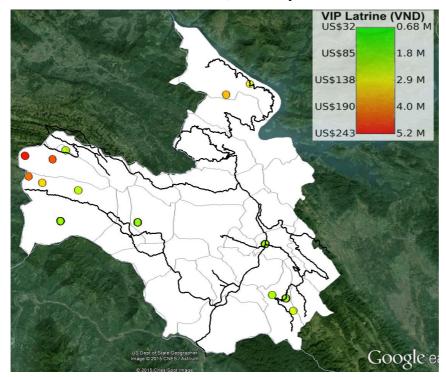


Figure 32: VIP latrine costs for commune centres and villages in Mai Chau

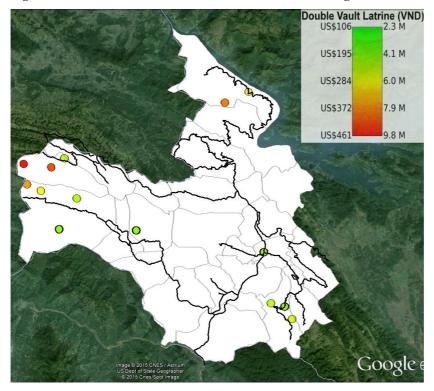


Figure 33: Double vault latrine costs for commune centres and villages in Mai Chau

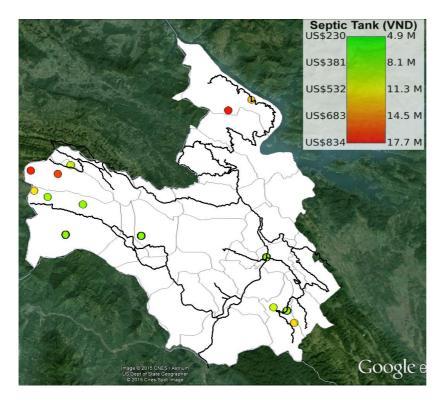


Figure 34: Septic tank latrine costs for commune centres and villages in Mai Chau

4.3 COST BREAKDOWN OF A TOILET

The same standard quantities of materials that were used in Muong Ang were used for understanding the costs of latrines in Mai Chau (see Table 2). The cost of materials in Mai Chai Town were as follows:

Table 6: Costs of toilets in Mai Chau Town

Toilet type	Cost in VND (and USD) in Mai Chau Town		
VIP latrine	761,000 (USD 36)		
Double Vault Latrine	1,917,150 (USD 90)		
Septic Tank Latrine	4,464,300 (USD 210)		

The average proportion of costs attributed to the main materials of VIP latrines is provided for Mai Chau communes in Figure 35. As for Muong Ang, the highest proportion of costs is attributed to bricks (up to 57% of materials costs). Note that in individual locations, the proportional costs can vary from the average considerably – see section 4.4.2 (specifically the sand section) for an example.

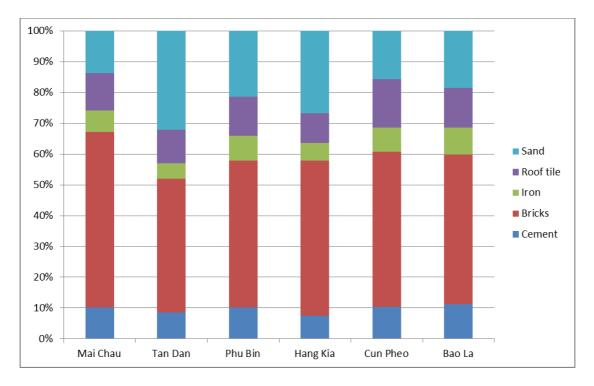


Figure 35: Proportion of costs attributed to main materials of VIP latrines in Mai Chau

The labour costs for Mai Chau district were the same as for Muong Ang, i.e. Master masons labour rates are approx. 200,000 VND/day (USD 9.40), while mason assistants charge approx. 150,000 VND/day (USD 7.00). The length of time to build the three types of latrines was also similar and as such, the same consistent rates for labour were used for Mai Chau locations.

4.4 MAIN ACTORS, PROCESSES AND LINKS IN THE VALUE-CHAIN

4.4.1 Key actors

The key actors in the value chain in Mai Chau were the same as for in Muong Ang, however 'transporters' (sometimes called mobile vendors) played a more dominant role by providing households with two services: the first was to purchase materials on their behalf (at retailers of the transporter's choosing) and the second is to provide delivery. In this sense, they played a middleman role and could negotiate buying prices with retailers and selling prices with households. More detailers are provided in Section 4.6.2.

4.4.2 Product-specific supply chains

Cement

In Mai Chau district, cement came from various locations:

- Locally produced
 - o Bao La cement producer
 - o Dong Bang commune producer
- Purchased by commune retailers from Mai Chau town retailers
- Agents
 - o Ninh Binh Province

- Luong Son District (Hoa Binh Province)
- Thanh Hoa Province
- Ha Tay Province

Cement was also sold to cement brick and ring producers, of which there were several in Mai Chau district. The sources and flows of cement, from wholesalers in distant provinces and producers in the district, are illustrated in Figure 36. It shows that households can obtain cement through the wholesaler supply chain, or through local production, which also sources brick and cement rings.

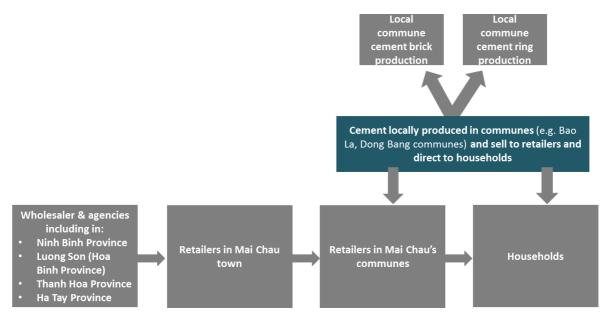


Figure 36: Sources and flows of cement

Latrine Pans

Latrine pans were available in both Mai Chau town (see Figure 37), where the variety of brands, quality and price was the greatest, and in some commune level supply shops, where mainly squat pans were sold. Both seated and squat pans came in various degrees of quality, with a corresponding range in price.

Seated pans sold for between 900,000 VND to 1.8 million VND (USD 42.13 - USD 84.27). The cheapest squat pans sold for 130,000 in Mai Chau town, however the shop owner noted their low quality. This shop owner also said around 20 squat pans were sold per month.

In the commune level shops, squat pans sold for between 180,000 VND - 300,000 VND (USD 8.43 - USD 14.05). One commune level shop owner noted the profit margin on squat pans sold was 5-7%.



Figure 37: A variety of toilet pans were sold in a shop in Mai Chau town

Sand

Unlike in Muong Ang where sand was cheap and widely available due to being locally sourced, in Mai Chau sand added significantly to the material and transport costs of toilets particularly in the most difficult to access locations. Logistically, transporting sand by motor

bike is also difficult. Sand weighs approx. 1.6 tonnes per cubic metre, thus posing significant additional effort when privately transported (see section 4.6.1). Figure 35 provided a snapshot of the average proportion each material makes up for VIP latrines. For sand, this varied considerably by location. The proportion of costs of sand for the villages where data was collected is provided in Table 7 below. For a VIP latrine, sand is up to 42% of the total cost of materials.

Table 7: Cost of materials for three toilet types including proportion attributed to sand

Village / Commune	VIP Latrine - Material Costs (VND)	Sand %	Double Vault Latrine - Material Costs (VND)	Sand %	Septic Tank Latrine - Material Costs (VND)	Sand %
Mai Chau Town	941,800	19%	2,277,150	16%	5,364,300	17%
Cai	1,510,000	40%	3,532,500	34%	8,415,000	36%
Bai Khai	1,510,000	38%	3,532,500	33%	8,415,000	34%
Na Phat	1,080,000	28%	2,512,500	24%	5,895,000	25%
Salong	1,105,000	29%	2,615,833	25%	6,040,000	27%
Na Lut	1,160,000	30%	2,472,500	28%	6,768,000	26%
Hang Kia Commune centre (Shop Cost)	1,293,000	36%	2,969,857	31%	6,953,000	33%
Thung Mạn	1,835,000	38%	4,382,143	32%	10,175,000	34%
Thung Mài	1,780,000	42%	3,950,000	38%	9,170,000	41%
Cun Pheo Commune centre (Shop Cost)	969,000	23%	2,244,500	20%	5,174,000	21%
Táo Nà	1,180,000	21%	2,690,000	19%	6,180,000	20%
Hin Pén	1,108,000	20%	2,559,000	17%	5,408,000	20%
Pheo	978,000	22%	2,279,000	19%	5,388,000	20%
Bao La Commune Centre (Shop cost)	938,000	25%	2,179,000	21%	5,028,000	23%

4.4.3 Locally sourced materials

The following materials were produced locally:

Cement – As noted above, there were local producers of cement located in several communes (see Figure 37).

Bricks – Both red bricks (made from clay) and cement bricks (e.g. see Figure 38 below) were produced in Mai Chau district. Cement bricks were mostly used for building latrines (as well as fences, pig pens and parts of houses), and they were cheaper and easier to produce compared to red bricks.



Figure 38: Brick production in Dong Bang commune

Cement Rings – cement ring producers were located in several of the communes of Mai Chau. One cement ring producer noted he bought the moulds for the rings for another producer last year and sold most rings to households. Cement rings sold for approximately 500,000-600,000 VND (USD 23 - USD 28) each.

Gravel was also produced locally in Mai Chau.

4.4.4 Masons

Masons acted as labourers only, not playing any role in the purchasing of materials. The services of masons were not always engaged by households in building latrines, with many households opting for simply models (e.g. VIP latrine) and building it themselves, not aware that the skills and experience of masons can assist in ensuring the latrine is hygienic and functional.

4.5 COSTS, EARNING PROFILES AND FINANCIAL PERFORMANCE OF DIFFERENT LINKS

4.5.1 Cement supply chain

Most shops in Mai Chau Town centre sold a variety of brands of cement of varying degrees of quality. Shops in commune centres usually sold only one brand of low quality cement, perceiving (rightly or not) that is what their customers prefer.

In Mai Chau Town, cement was sold for between 120,000 VND - 135,000 VND (USD 5.61 - USD 6.32) per 100 kg. One retailer noted that cement sold at 130,000 VND/100 kg, the profit margin was 3%. While the volume of sales of cement was not known at shops in Mai Chau Town, the turnover in one commune level material supply shop noted it to be 20-25 tonnes per month; while another commune level shop said theirs was 30 tonnes per month. A comment was made in Mai Chau Town that sales for latrines was very low when compared to sales for other types of construction, such as houses.

Small discounts for bulk purchase were permitted by some shops. For example, for purchases of over 1 tonne of cement, one commune shop permitted a discount of 2%, while another

offered an 8% discount for purchases over 1 tonne of cement. A district centre shop made a general comment that "large volumes are sold at a cheaper price".

Figure 39 illustrates the price differences from retailers in Mai Chau Town and Cun Pheo commune, and also the prices paid by households in three villages in Cun Pheo commune. Costs at the household level include transport costs. Thus, households can decide whether they prefer to pay a single fee for cement that includes transport, or purchase the cement from Mai Chau Town themselves and arrange and pay for its transport themselves.

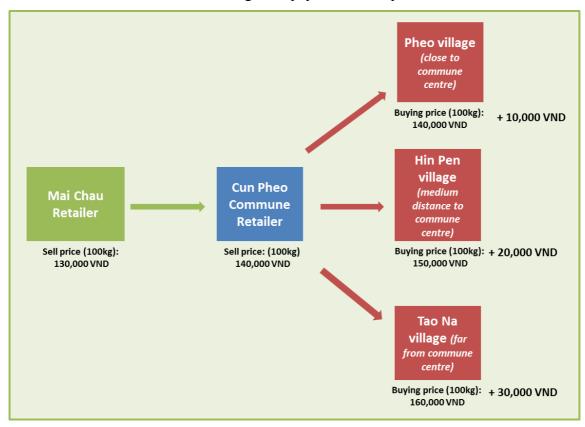


Figure 39: Cement costs at Mai Chau Town and Cun Pheo commune retailers, and household purchase prices (including delivery) in three villages

4.5.2 Toilet pan supply chain

Toilet pans were delivered to Mai Chau town and commune shops by their agents or suppliers, who were usually based in Hanoi. Shop owners ask the agent's driver to transport these products by combining or collaborating with local trucks which transport other products. This saves costs and prevents the need to rent a whole truck for a small quantity of goods. Shop owners were unwilling to divulge their own purchase price of latrine pans, thus profit margins were unable to be calculated in Mai Chau.

4.6 INFLUENCE OF TRANSPORT AND ACCESSIBILITY

Some of the modes of arranging the delivery of construction materials (including for latrines) were different in Mai Chau district when compared to Muong Ang district. These are described below.

4.6.1 How households purchase and transport materials for sanitation

Households drew on various options to purchase materials for latrines and have them delivered. One common approach was through engaging the services of transporters. Upon request from households, transporters purchased and delivered materials and charged a combined, single fee for doing so. This approach was preferred by some households who were either unfamiliar with the types and quantities of materials available/required for their construction, and/or those who saw their distance from supply shops as an obstacle to obtaining materials and saw the services of transporters as an attractive alternative – as described by a householder: "I don't anything about materials, so even if I go to the shop I don't know, so have to trust the transporter." In this instance, the transporter acts as a 'middle man' who can bargain prices at both ends (with the shop and with the households). A household customer noted that: "We just know the price; we don't know where the transporter gets the materials from, if in Mai Chau or another district."

Another option was for the household to call the shop directly and have materials delivered. One household noted: "You don't need to go to Mai Chau, just call the shop."

In some villages, delivery trucks could only reach to the centre of the villages. Many households were located on high, steep hills with only very small paths to their house, requiring the transportation to include two modes ways: by truck to the village centre and then the hire of local labours to manually carry materials to households. In this case the transporter's cost therefore depended on the distance to village centre, the degree of difficulty of road accessibility, and the relationship and negotiation between transporters and customers plus negotiated costs with local labourers. The other combination of modes was by truck to the village centre then by personal motor bike to the household (as described for Muong Ang). This latter approach was possible where accessibility permitted motor bikes. These two options, including associated costs with each option, are seen Figure 40.

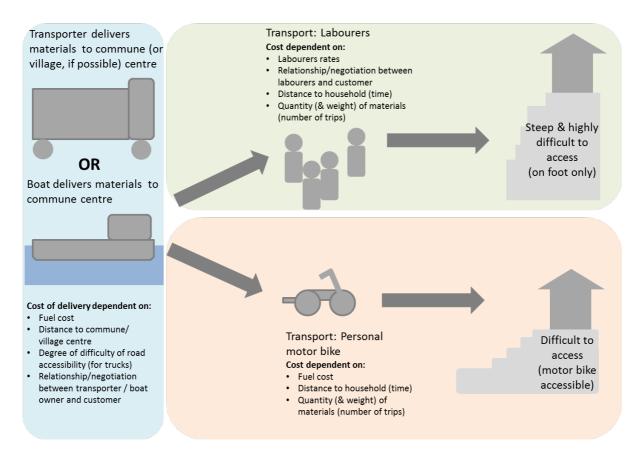


Figure 40: Transport options in difficult to access locations

In Tan Dan commune in the north of Mai Chau district, another transportation option was available for nearby households which involved delivery by boat, across the Song Da Reservoir (part of a hydroelectric scheme – see Figure 41). Using this option, households could request orders through the boat transporter, who purchased materials in Mai Chau town and delivered these at the Tan Dan commune centre. This was the preferred option compared to truck delivery (in part due to incomplete roads between Mai Chau and Tan Dan) and generally described as cheaper. While the cost of materials was cheaper when purchased in Mai Chau, if households chose to purchase materials from there, they then incurred a higher personal transport costs.



Figure 41: The view across Song Da Reservoir near Tan Dan commune (left) and boats unloading materials on the banks of the Reservoir

4.6.2 Profiles of typical transportation business types

Transporters (sometimes called 'mobile vendors') were based in the district capital as well as some at the commune level (e.g. in Salong village, Phu Bin commune). Transporters based in neighbouring Tan Lac district also served communes in Mai Chau district. For example, one of the transporters interviewed was based in Tan Lac district and served Phu Bin, Ba Khan and Noong Luong communes.

Transporter based close to Tan Lac district capital (Phu Cuong village, Tan Lac district – neighbouring Mai Chau district)



This transported had been operating for six years and had a 2.5T truck and a mini-truck. In addition to providing transporting services, he also produced cement bricks and sold cement. He served areas within a 20km radius of where he was based, including Phu Bin, Ba Khan, Noong Luong communes in Mai Chau district.

For deliveries with the 2.5T truck, he charged between 1.2M VND and 1.5M VND from Phu Cuong to Phu Bin comunes, and 550,000 VND from Phu Cuong to Ba Khan communes.

Annual maintenance costs of the truck amount to a total of 5M VND and included replacement of tyres (20M VND p.a.) and government tax/fee (5M VND p.a.).

The main challenges faced included growing competition and cash flow issues, as 50% of his customers paid using credit and tended to pay during harvest time when they had cash: "In the past it was good but now there are too many transporters and material shops. The most difficult thing is the customers that pay in credit. A lot only pay in harvest time but many households even in harvest time don't have money"

Commune level material shop transporter (Dong bang commune)



The shop owner and transporter had been in operation for approximately 3 years. He owned a 5T truck and served neighbouring communes, including communes in Son La province.

He charged between VND 300,000 and VND 400,000 from Dong Bang to Phuc San communes, and VND 2M to Tan Dan commune. However, he "rarely goes to Tan Dan as profit not worth it."

For customers purchasing large quantities of sand, his approach was to go directly to the agent and deliver it to the customer's house. In that case, he charged 450,000 VND including delivery to Phuc San and Tan Dan communes. For other materials, the transport price was calculated on top of material price.

Annual maintenance costs of the truck amount to a total of 37M VND, which includes replacement of tyres (30M VND p.a.) and batteries (two batteries at 1.5M VND p.a each), and government tax/fee (4M VND p.a).

He did not receive discounts from agent even when buying large quantities, as price is pre-negotiated.

The main challenge he faced was cash flow as he had to pay the distribution agent in cash, however most of the customers pay in credit.

4.6.3 Profit margins in transportation businesses

The range of costs provided by interviewees of buying trucks varied and is illustrated in the figure below.

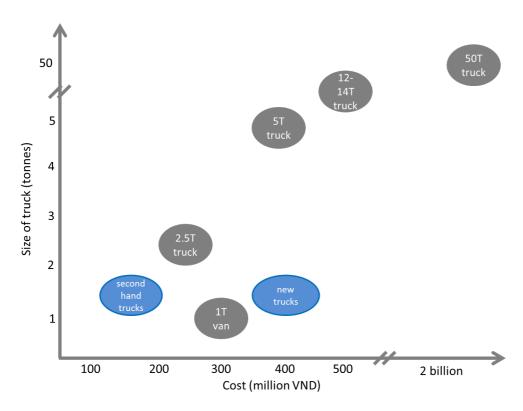


Figure 42: Cost of various sized trucks used to transport materials

Additional costs associated with running transport services included:

- Fuel costs
- Payment of drivers
- Maintenance (one transporter estimated 45 million VND p.a. (USD 2,100) for maintenance while another estimated 30 million VND (USD 1,400)).
- Vehicle tax
- Repayable finance

Barriers to entry in the transportation industry were said to be the capital required to purchase the vehicles, and associated risks with taking loans for procuring vehicles. An estimate of profit margins for two transport providers is provided in Table 8. Note the costs and profits do not include labour time. Table 9 provides additional detail regarding costs of transporting to nearly communes in Mai Chau from several transport operators.

Table 8: Costs and profits associated with two deliveries to communes in Mai Chau district

	2.5 tonne truck (Tan Lac based Transporter)	3.5 tonne truck (Dong Bang based Transporter)
Delivery charge (VND)	1,350,000	350,000
Fuel Cost (VND)	500,000	75,000
Maintenance (VND, per trip)	125,000	166,667
Profit (VND, less labour costs)	725,000	108,333
Profit margin (net profit divided by selling price, as above, less labour costs, as above, less labour costs)	54%	31%

Table 9: Transport costs across Mai Chau district

Shop/ transporter/ household location	From	То	Distance (km)	Cost	Notes				
Costs provided by	Costs provided by shops and transporters								
Mai Chau	Mai Chau town	Hanoi	160km	10 million VND	Cost based on weight for long distances				
town	Mai Chau town	within town area	3km	100,000 - 150,000 VND	Rent / use smaller vehicles for trips in town $(1 - 3T)$				
Bao La	Bao La	Mai Chau town	30km	650,000 VND					
commune	Bao La	within commune	2km	60,000 – 100,000 VND	Rent / use smaller vehicles for trips in commune				
	Chieng Chau commune	Short distances	4-5km	50,000 VND	3T truck				
Chieng Chau commune	Chieng Chau commune	Short distances	4-5km	100,000 – 150,000 VND	5T truck				
	Chieng Chau commune	Longer distances	20-30km	300,000 – 400,000 VND					
	Cun Pheo	Mai Chau town	30 – 50km	600,000 VND					
Cun Pheo	Cun Pheo	Bao La	10 – 20km	300,000 VND					
commune	Cun Pheo	Pieng Ve	10 – 20km	300,000 VND					
	Cun Pheo	Cun Pheo	1 – 10km	200,000 VND					
	Cun Pheo	Mai Ha	20 – 30km	500,000 VND					
Bao La	Bao La	Mai Chau town	30 – 40km	800,000 VND					
commune	Bao La	Pieng Ve	10 – 20km	300,000 VND					
	Bao La	Cun Pheo	10 – 20km	300,000 VND					
Tan Lac district, Phu	Phu Cuong commune	Phu Bin	25km	1.35 million VND	2.5T truck				
Cuong commune	Phu Cuong commune	Ba Khan	30 – 40km	550,000 VND	2.5T truck				
Dong Bang commune	Dong Bang	Phuc San	20 – 30km	300,000 - 400,000 VND	5T truck				
Commune	Dong Bang	Tan Dan	unknown	2 million VND	5T truck				
Costs provided by	households		1						
	Hang Kia	Thung Man	10km	800,000 VND					
Hang Kia	Hang Kia	Thung Mai	8km	800,000 VND					
	Hang Kia	Hang Kia	1-2km	200,000 VND					
Noong Luong, Son La	Noong Luong, Son La	Thung Man	30km	1.5 million VND					
	Noong Luong, Son La	Thung Mai	28km	1 million VND					
	Noong Luong, Son La	Hang Kia	20km	700,000 VND					
Mai Chan	Mai Chau town	Thung Man	50km	unknown					
Mai Chau town	Mai Chau town	Thung Mai	48km	1.5 million VND					
	Mai Chau town	Hang Kia	40km	1 million VND					

4.6.4 Materials costs versus transport costs

Figure 43 below shows the proportional costs of materials and transport for the three toilet types in Mai Chau's communes (as for Muong Ang, note that labour costs have been excluded from this analysis, given consistent labour costs were estimated, independent of location). Results are similar as for Muong Ang district, where transport costs comprise the highest proportion of costs for VIP latrine (over half the cost in some locations (63%), with an average 27%). For double vault latrines, the proportion is less (average 24% of materials plus transport cost) and least for septic tank latrines (up to 42% of the cost, with an average of 19%).

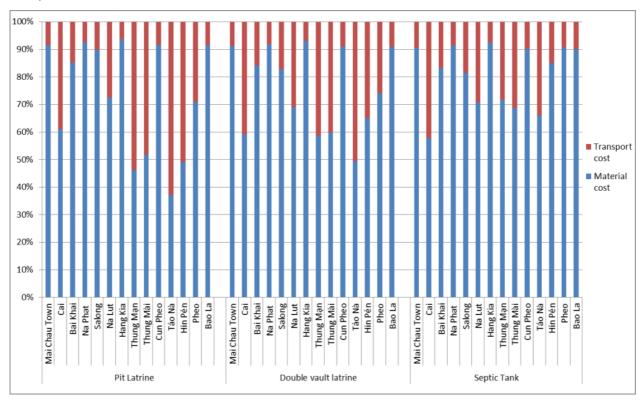


Figure 43: Proportion of costs of materials and transport for three toilet types across Mai Chau Ang district

There is considerable variation in the proportions comprising material and transport costs, highlighting the small data set and the need to look beyond single locations and reflect on the broader message of the findings. Actual costs are presented in Figure 44.

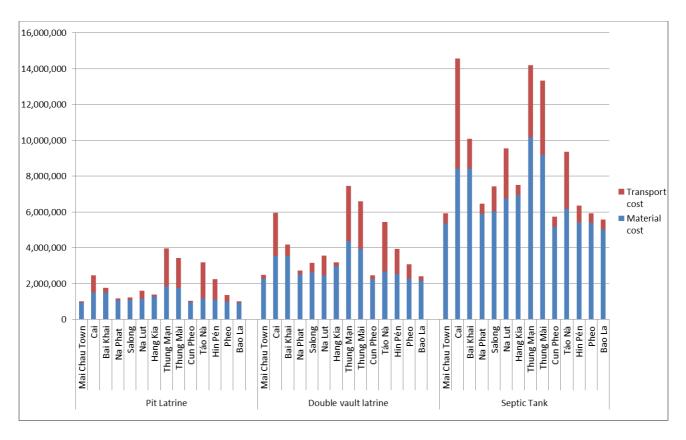


Figure 44: Actual costs of materials and transport for three toilet types across Muong Ang district

An interesting comment raising the issue of high transport costs associated with difficult to access communes was made by one of the commune level transporters, who noted: "It is more difficult to transport to remote communes. They incur higher transport costs, thus total cost is higher." This issue is indeed reflected in the findings presented here, indicating that if progress in expanding hygienic latrine access is to be achieved, this challenge needs tackling (see Section 5 for suggested recommendations).

The following maps (Figures 45-47) display the data geographically, highlighting the influence of remoteness on cost and the higher proportion of transports costs for more distant locations.

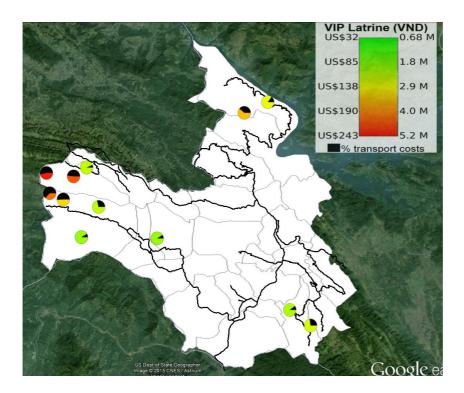


Figure 45: VIP latrine materials and transport costs

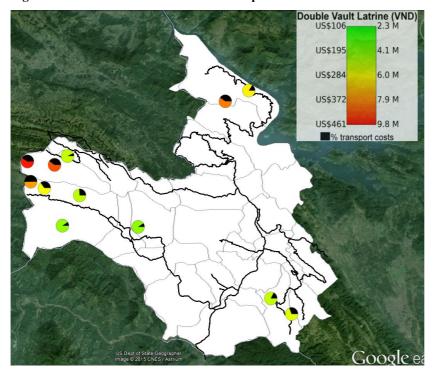


Figure 46: Double vault latrine materials and transport costs

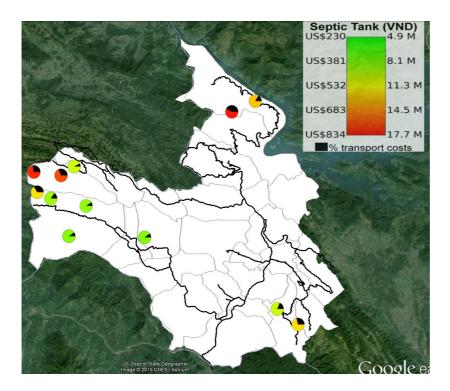


Figure 47: Septic tank latrine materials and transport costs

4.6.5 Competition

Considerable competition in the transportation sector existed in Mai Chau district. Many transporter businesses were operational and had a range of truck sizes. Most supply shops (both in Mai Chau town and at the commune level) either owned their own trucks with which they delivered their materials (including construction materials and agricultural products) to households across the district, or had relationships with transporters to enable them to deliver customer's goods. For example, one commune level shop noted he was able to rent the truck of a relative to transport goods for customers, while a shop in Mai Chau noted "we cooperate with truck drivers".

Two commune level shop owners with associated transport businesses noted that the improvement in road conditions made it more convenient to offer this service. Many shops offered free transport for households within a close distance (e.g. 2km).

4.7 OTHER FACTORS AFFECTING CRITICAL LINKS IN THE CHAIN

4.7.1 Demand and affordability

A trend of increasing demand for construction materials was apparent, with many shop owners noting a greater number of customers over the last three-five years – one commune level shop owner noted a 30% p.a. increase in sales over the last three years. However, the demand for latrines was not noted to have changed, with the vast majority of construction materials purchased for houses and other projects. One commune level shop was in the process of expanding, and planned to sell a wider variety of products upon completion, including toilet pans. This was despite their comments that due to low income, households in the area tended not to build latrines.

Coinciding with the increased demand in construction materials was a reported increase in the number of shops selling construction materials to meet this demand – one commune level shop owner noted an increase from two shops to seven in his area. Despite this increase in shop numbers, no shop owners reported a change in their behaviour in terms of marketing, promotion or sell prices, given their already low profit margins (see below).

4.7.2 Characteristics of materials supply shops

Supply shops in Mai Chau had similar characteristics to those in Muong Ang, in that shops were mostly family run, and a mix of formally registered and smaller informal businesses. Marketing was not practiced despite acknowledged competition with other shops, and all relied on their reputation for return business. The majority of supply shops accepted credit as a form of payment, however; this placed a considerable burden on the business owner, since they were usually not permitted to pay their own costs to suppliers in the same way. This restriction of cash flow proved to be a barrier for businesses taking loans and expanding their business and this led to some shop owners being less willing to accept credit from all customers.

Size, age, and profit margins

Most shop owners and transporter businesses in Mai Chau town and communes were family operated, with either husband and wife teams or sometimes with children working in various roles (e.g. truck driver, accountant, sales assistant etc.). Many noted their advantage was they were well known as they had been operating for some years and customers knew of them already.

Most shops noted the low profits related to the sale of construction materials when compared to other consumption goods, with cement noted by one shop owner as having the lowest profits from all materials sold. One commune shop noted their overall profit margin to be 5-7%, while another estimated less than 10% from construction materials.

Competition and marketing

Promoting their businesses was not something any of the shop owners did, with many believing it was not necessary or useful. This was despite competition existing in both in Mai Chau town and some communes. In Mai Chau town where there were several supply shops (three or four), shop owners relied instead on their wide range of brands and products, their long operating history, their customer service, word of mouth from past customers (including referrals from authorities), and their low prices to attract customers.

A commune level shop owner noted: "No promotion is necessary. After some time, people will know us... word of mouth only." Another commune level shop owner noted the existence of competition, and the advantages they had over his business ("they opened before me, they know more customers"); however then noted that "promotion is not necessary and not useful – it is a very small market and people know each other". Another believed that his old age was a barrier to expanding his business and new businesses are younger "and may want to expand".

All communes where data was collected had construction material supply shops (however as noted, only one brand / type of material of low quality was usually available at the commune level). In Hang Kia commune, shops did not sell sanitation specific products (e.g. toilet pans).

Credit and discounts for customers

Shops at district level and commune level varied in terms of their acceptance of credit as a form of customer payment. One district centre shop had offered credit to customers in the past, but found it made better sense to reduce their prices and collect costs at the time of purchase rather than chase payments later, which they noted was time consuming and tiring. Another district shop reluctantly offered limited credit to customers, with payment required within the month. This shop owner made exceptions for well known, long term customers who enjoyed more relaxed credit terms, with no interest rate. Another district shop provided gifts (such as beer) for bulk purchases made by loyal customers. One shop owner in town was firm in their not offering discounts, saying: "We don't offer discounts. No matter what, it's purely business."

At the commune level it was much more common for shops to offer credit, given most households were poor with limited access to large amounts of capital, thus if they wanted to sell their goods, they needed to offer households credit, as noted by one shop owner: "If customers are not allowed to pay late, it is difficult to sell". Credit duration depended on trust built between the shop owner and customer. One shop owner noted: "Customers pay late, usually after their construction project is finished. Around 50% of customers pay late – around two or three months". Another commune shop owner charged higher prices if customers bought on credit, with the price dependent on how long the credit terms were. This same shop owner noted the majority of customers bought with credit on 90% of the purchase value. Bulk purchases also attracted discounts: "We are a small business and profit is not a lot, that's why we only offer discounts for very big quantities. For small quantities we don't offer discounts."

The need for commune level shops to offer credit as a means to attract customers meant shop owners had constrained cash flow. This posed challenges when shop owners needed to pay their suppliers (who did not accept credit) and/or should they want to expand their business, or if they had their own loans to repay. One shop owner noted he was owed a debt of 200 million VND (USD 9,350) and was still unable to collect the debt after a few years.

In terms of discounts, most shops were not able to provide discounts to the poor (citing already low profit margins), noting that late payments were offered instead.

Relationships and partnerships

As alluded to above, relationships between the shop owner and customer played a part in the terms of sale. Loyal customers enjoyed more relaxed terms of credit and were sometimes offered gifts for their bulk purchases. Prices for materials were not always fixed and shop owners and customers negotiated on price and terms to reach an agreement. This sometimes involved trading other goods, not just cash for payment, for example one shop owner accepted payment in rice, corn and cassava as his side business involved a processing plant.

Partnerships between shop owners and transporters were also common, especially if the shop owner did not have access to transport for household delivery. Similarly, terms were negotiated and based on trust and the closeness of the relationship between the partners.

4.7.3 Forms of credit for small businesses

It was common for shop owners and transporters to borrow from banks for shop and transport business needs. Most interviewees commented how this was not a problem and they could often extend the terms if needed. Rates were around 13% p.a. Often the land ownership certificate was used as collateral for the loan.

Other business owners noted their preference and experience in borrowing from family and friends, while a few interviewee business owners has no history of taking loans, relying instead on savings.

As noted above, despite offering credit to their customers, most shop owners were required to pay their own suppliers and agents in cash. Managing their debts was therefore a challenge for some businesses.

4.8 INFLUENCE OF CURRENT GOVERNMENT POLICY AND REGULATORY FRAMEWORK

Challenges and opportunities relating to government policy and the sanitation supply chain at the national, provincial and commune level discussed in section 3.8 are also relevant for Mai Chau.

Additional data on policy and regulatory framework options was available for Mai Chau through the parallel SNV-WSP study on Rural Sanitation Demand Creation. The study involved asking Mai Chau households, producers and businesses selling sanitation products questions relating to their views on the government's policy on developing the sanitation supply chain.

A Chieng Chau brick producer was quick to point out the challenges of transport costs to remote locations (also identified in our research): "It is more difficult to transport to remote communes. So [remote locations have] higher transport cost, thus total cost higher. Government should support households in these remote areas. Shops could support by

lowering price a bit, but not much as there will be no profit".

The idea for the government to support remote communes in accessing sanitation is a possibility. Our results show that households in remote communes typically poorer than those in town centres, and they have lower hygienic latrine coverage. As noted in Section 3.8, while household loans for sanitation were stated as being available by national stakeholders through the Vietnam Bank for Social Policy (VBSP), how these loans were accessed in reality at the commune level varied (see Figure 48: Road building in Tan Dan commune Gero and Willetts, 2014). The VBSP loans



were supposedly targeted at the poor, specifically for reasons of water and sanitation. The role of mass organisations was also important in assisting the poor to access these particular VBSP loans, however, the level of activity of mass organisations at the local level varied. One

respondent noted awareness of loans through mass organisations for productive purposes, but not for sanitation purposes. Past SNV work has also shown that the proportion of the poor who took out loans was lower than the equivalent proportion of the population (SNV, 2012).

Several of the respondents in the SNV-WSP study noted how the roads had improved over recent years, and this assisted in allowing small motorised transport access where previously access was on foot or by buffalo. During our field work in Tan Dan commune, the road was being built which would allow easier access (and more transport options) for households (see Figure 48).

Some households knew of a program to support poor households in building latrines, however no details were provided on who accessed these programs, who ran them or any outcomes of the program. Business owners were not aware of policy or programs to support them, while one Mai Chau retailer noted "I do not know of any program, if there's a program to lend at low interest rate, that would be good".

5 DISCUSSION AND IMPLICATIONS

5.1 COMPARISON ACROSS MUONG ANG AND MAI CHAU

Poverty, toilet coverage and costs to build a toilet

In Muong Ang and Mai Chau, there was a strong correlation between poverty, low hygienic toilet coverage and high costs of toilets (as seen in Figure 11 and Figure 29). In the remote communes, poverty and hygienic latrine coverage were lowest while costs of toilets were the highest.

Major cost components in building a toilet

The major material components to build toilets included cement, bricks, iron, sand, roof tiles (used for superstructure) and a toilet pan (only required for septic tank latrines). Apart from the toilet pan, these materials were common construction materials and were readily accessible in the district towns and in many commune centres. The toilet pan comprised a relatively small percentage of total materials cost in both districts.

Consistent labour rates across both districts were used, estimated based on data collected. Material costs were higher in Mai Chau district, which can be attributed to the need to purchase and transport sand, given it was not locally available as it was in Muong Ang. Transport costs were also higher in Mai Chau district, however this can in part be explained by the locations where data was collected – in Mai Chau we included more remote and difficult to access villages which were not visited to the same degree in Muong Ang.

In both districts, the material that comprised the highest proportional cost was bricks. Whether made from cement (as in Mai Chau) or clay (as in in Muong Ang), bricks made up an average of 50% of the cost in Mai Chau and 46% in Muong Ang for VIP latrines. The proportion was higher for double vault (61% in Muong Ang) and septic tank latrines (71% in Muong Ang).

The proportional cost of transport was highest for the difficult to reach villages – when compared to materials costs this was 50-60% for some locations (e.g. Tao Na and Thung Man in Mai Chau District; and Ngoi Cai and Xuan Lao in Muong Ang District).

Toilet costs in each district

The costs of toilets for households in this research far exceeded the government's estimates. The total cost for the three toilet types is provided in

Table 10, including averages for each district and specific costs in each location. Note that the data collection locations in Mai Chau consisted for more remote and difficult to reach locations (leading to higher costs from transport), thus the two districts should not be compared as equals. Also included are the estimates of latrine costs from the Ministry of Health, and is supposedly indicative of budget estimate for household latrine. These costs are far below the actual costs found in Muong Ang and Mai Chau, particularly for remote locations. For example, for VIP latrines, our research shows that in remote locations, they are 168% of MoH costs. For Mai Chau, costs of double vault latrines in remote locations are almost 3.5 times the estimates from MoH. **Error! Reference source not found.** highlights ow the MoH estimates are far below the costs recorded in this research – with the example of double vault latrines provided.

Table 10: Average cost of latrine types in Muong Ang and Mai Chau Districts, with MoH estimates included* (and % of MoH estimate included in shaded cells)

	VIP latrine		Double va	ult latrine	Septic tank latrine		
	VND (USD)	% of MoH estimates	VND (USD)	% of MoH estimates	VND (USD)	% of MoH estimates	
Muong Ang (average)	2,369,846 (\$109)	132%	4,921,031 (\$226)	180%	8,674,240 (\$398)	118%	
	1,882,625	105%	4,193,500	153%	7,711,250	105%	
	1,992,000	111%	4,227,250	154%	7,928,000	108%	
	2,108,000	118%	4,507,250	165%	8,008,000	109%	
ses	2,118,000	118%	4,539,000	166%	8,041,250	109%	
illag	2,142,625	120%	4,615,500	169%	8,273,000	113%	
v bu	2,150,000	120%	4,632,000	169%	8,278,000	113%	
es a	2,178,000	122%	4,647,500	170%	8,392,000	114%	
Muong Ang Communes and villages	2,210,000	123%	4,670,000	171%	8,440,000	115%	
S.	2,210,000	123%	4,719,000	172%	8,485,000	115%	
Ang	2,291,000	128%	4,864,000	178%	8,575,833	117%	
ng .	2,382,625	133%	4,977,250	182%	8,611,250	117%	
Muo	2,611,792	146%	5,321,000	194%	8,810,000	120%	
	2,682,625	150%	5,427,250	198%	9,311,250	127%	
	2,968,000	166%	5,604,000	205%	9,473,750	129%	
	2,982,625	167%	5,877,250	215%	9,691,250	132%	
	3,007,625	168%	5,914,750	216%	10,758,000	146%	
Mai Chau (average)	2,924,233 (\$135)	163%	6,035,155 (\$278)	220%	11,315,156 (\$521)	154%	
	2,025,400	113%	4,399,800	161%	8,186,133	111%	
	2,029,200	113%	4,465,300	163%	8,332,133	113%	
Se	2,056,400	115%	4,497,950	164%	8,522,433	116%	
villages	2,167,400	121%	4,512,500	165%	8,538,000	116%	
d vi	2,230,360	125%	5,079,000	186%	8,966,533	122%	
s an	2,378,000	133%	5,161,113	189%	9,053,133	123%	
nne	2,380,400	133%	5,190,657	190%	10,018,347	136%	
шш	2,597,000	145%	5,576,500	204%	10,111,133	138%	
Co	2,772,200	155%	5,938,200	217%	11,958,933	163%	
Mai Chau Communes and	3,258,100	182%	6,194,900	226%	12,158,667	165%	
[ai C	3,471,400	194%	7,447,600	272%	12,689,400	173%	
W	4,177,800	233%	7,961,300	291%	15,943,867	217%	
	4,433,600	248%	8,601,200	314%	16,779,000	228%	
	4,962,000	277%	9,466,143	346%	17,154,467	233%	
MoH estimate**	1,790,858 (\$82)		2,737,929 (\$126)		7,352,275 (\$337)–red brick		

^{*}cost includes materials, labour and transport for Muong Ang and Mai Chau, cost includes materials and labour for MoH

^{**} See Decision No 14/QD-MT dated 23 January 2014 by VIHEMA/MOH

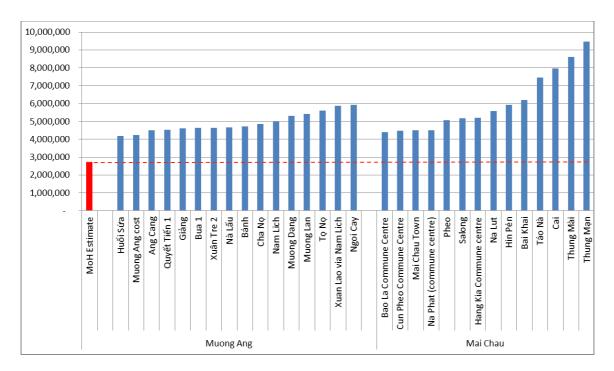


Figure 49: Double vault latrine costs for Muong Ang and Mai Chau locations, with MoH estimate also included

Costs in different locations

Variation in costs across different locations were due to:

- transportation costs
- supply chain costs influencing the price of materials
- accessibility of locally available products, e.g. sand, bricks, cement
- competition between shops, which kept prices similar

Low materials and transport costs were found at the district capitals in both locations, which is unsurprising given issues of competition between the multiple shops and negligible transportation costs. An exception was found in Mai Chau district where some of the commune level shops (e.g. Cun Pheo and Bao La) sold materials cheaper than in the district town. One brand of cement and bricks of low quality was sold in these commune shops, with the shop owners believing this was what their customers wanted.

In Muong Ang district, the highest costs were found in Ngoi Cay, Xuan Lao and To No - all locations that were difficult to access and incurred high transport costs.

Supply chains for externally sourced materials

Our research assessed costs associated with cement and toilet pans for the two districts.

Cement: Low profit margins were accepted for the sale of cement and as such, there was limited opportunity to reduce its costs in the supply chain. In Muong Ang district, most cement was locally produced in Dien Bien Phu (the provincial capital). Profit margins for cement were typically very low for retailers (up to 7% in Muong Ang town). The more remote commune centres (e.g. Ang To) sold cement for higher prices (up to 40% higher than the wholesale price at the factory) to account for costs associated with transporting the material to their shop.

In Mai Chau, profit margins were reportedly even lower than in Muong Ang, with 3% calculated at one Mai Chau retailer. Small discounts were provided for bulk purchases in

some shops – dependent on the strength of the relationship between the customer and the retailer. Cement sold for 30,000 VND higher than Mai Chau town in smaller, remote villages (e.g. in Tao No, prices were 30% higher than in Mai Chau Town).

Toilet pans: Given low profit margins, there was little opportunity to reduce the cost of toilet pans. Additionally, toilet pans comprised a small proportion of total material costs (between 3-9% in Muong Ang and 1-6% in Mai Chau). Toilet pans were manufactured in provinces near to Hanoi, e.g. Thai Binh province. In Muong Ang District, one of the most significant costs involved in toilet pan purchase for locations outside the district centre was transport, for example, in Ang To commune, squat pans were sold at five times the price as in Muong Ang town. In Mai Chau, one commune level shop owner noted the profit margin on squat pans sold was 5-7%.

Squatting pans were preferred by households in both Muong Ang and Mai Chau, with brand name not important in deciding which to purchase.

Locally sourced materials

Availability of locally sourced materials made a significant difference to overall material costs. In Muong Ang and Mai Chau, there were local cement manufacturers and as such, the price of cement at each of the town centres was similar (135,000 VND / 100kg).

Bricks were also produced locally in both districts. In Muong Ang, there were local producers of both cement and red (clay) bricks while in Mai Chau, only cement bricks were locally made (there was a red brick factory 65km away). The cost of cement bricks differed considerably between the two districts. In Muong Ang, cement bricks cost approximately 1,350 VND per brick, while in Mai Chau they cost approximately 2,400 VND per brick. Bricks comprise the largest proportion of material costs for both districts.

Sand was locally available in Muong Ang district, and households were able to easily and cheaply procure enough sand for their household latrine construction such that costs were negligible. In Mai Chau this was not the case. Sand therefore added significantly to the overall costs of materials, also posing logistical challenges in transportation to remote households.

Transport costs and transport business

Transportation of toilet materials to villages: Effort and cost to transport materials to remote households (i.e. the number of trips, fuel costs and potential missed labour time) presented a significant barrier to households accessing even the simplest of hygienic latrine options.

Households used a combination of methods to transport sanitation materials to their homes in both districts. Many households living in remote villages could not rely on formal truck transporters to their homes as roads were either inaccessible by truck, or there simply were no roads to their houses. Combining truck transport (to commune or village centre, or drop off point on a road junction) with motor bike, boat (in Mai Chau – Tan Dan commune) and on foot was often required given the steep, muddy and slippery conditions to remote households in both districts.

In Muong Ang, many households purchased materials in local commune shops then self-arranged transport on their private motor bike to their homes, taking opportunistic approaches in doing so (i.e. coming home with a load of materials after going to the village for other purposes). This was also the case in Mai Chau, however, in this district there was a greater reliance on truck transporters, who acted as a middle-man in purchasing then transporting

materials to as close as possible to the household (i.e. this could be to a junction on the road or the village centre). From there, households would use their private motor bike or local labourers to move materials to their house.

Given the prominence of transportation by motor bike, it is important to understand the logistical requirements and scale involved in transporting materials for the three latrine types. These are provided below and are based on the weight of material required for each toilet type, and the capacity of a motor bike (according to local data). See Table 11 for details.

Table 11: Number of trips required for transportation by motor bike for three toilet types

	VIP latrine	Double Vault Latrine	Septic Tank Latrine
Cement (P=100kg, DVL=200kg, STL=200kg)	2	3	3
Bricks (P=600kg, DVL=2000kg, STL=5400kg)	10	33	90
Sand (P=1600kg, DVL=3200kg, STL=8000kg)	27	54	133
Other (e.g. roof tiles, toilet pan)	3	3	3
TOTAL TRIPS	42	93	229

Note: Weights for materials are included where P denotes VIP latrine, DVL denotes double vault latrine and STL denotes septic tank latrine.

Table 11 shows that even for a VIP latrine, 42 trips by motor bike are required. Even for households living close to the village centre (or from the materials pick-up point), considerable time is needed to dedicate to this task, as well as fuel costs and potential missed labour time. This is a significant barrier to households accessing even the simplest of hygienic latrine options. For transportation of septic tank latrine materials, 229 trips are required which is unrealistic to think a householder would dedicate time towards.

Transport sector: Emerging trends in the transport sector indicate that with increasing competition and improved road access, transport costs may reduce in coming years. In both districts there were an increasing number of truck transporter businesses emerging, providing services to both supply shops and households for delivery of materials. While profit margins were reported high (e.g. up to 69% in Muong Ang), the increasing competition was driving prices down. The prices charged by transporters in both locations were also negotiated between the customer (either shop owner or householder) and the transporter business owner, and relied on the strength of the relationship and the transporters knowledge of the delivery destination (e.g. distance, condition of the road).

In Mai Chau district, a key difference to Muong Ang was the presence of transporters who householders called upon for both the purchase and delivery of materials. Some householders preferred this option when they were unfamiliar with the types and quantities of materials available/required for latrine construction, and/or those who saw their distance from supply shops as an obstacle to obtaining materials. The transporter acted as a 'middle man' who bargained prices with the shop and with the households.

Materials supply shops

Material supply shops widely accepted credit from customers and in turn, this restricted their cash flow and thus their ability to provide further discounts and provisions for the poor. Material supply shops were important actors in the sanitation supply chain, stocking a range of materials for latrines including cement, bricks, iron, toilet pans and roof tiles – as well as a broader range of other construction related materials. Some shops owned their own trucks to enable the delivery of their products; others had informal relationships with transport providers for delivery, while smaller informal shops did not have delivery options.

In both districts, shops were often family run, with some having formal status as enterprises and others being more informal. Both approaches were legally permitted and had benefits and drawbacks depending on the perspective of the shop owner. Supply shops in the district towns and some communes were aware of other nearby competitor shops but none went to any lengths at deliberately marketing their products. All relied on their reputation such that their loyal customers would recommend them to others, and make return trips.

Another commonality across districts was the requirement for shops accept credit as a form of payment for their products. Many noted that they were forced to accept credit as their customers were poor and unable to pay the full cost upfront. The terms of credit were negotiated and dependent on the trust and strength of the relationship. Shops accepting credit from customers placed a considerable burden on the business owner, since they were usually not permitted to pay their own costs to suppliers in the same way. This restriction of cash flow proved to be a barrier for businesses taking loans and expanding their business (see below). In Mai Chau, this had led to some shop owners being less willing to accept credit from all customers.

Access to credit and loans for enterprises

Material supply shops were constrained in their finances due to limited cash flow (as mentioned above), and this has a flow on effects to their customers. Enterprises in both districts accessed loans from banks such as the Vietnam Bank for Agriculture and Rural Development for establishing or expanding their business. One shop owner did note that the loan – while used for the business – was actually taken out under terms supposedly for agricultural purposes.

Enterprises also accessed credit and loans from family members, while others drew upon their own personal savings. As noted above, despite offering credit to their customers, most shop owners were required to pay their own suppliers and agents in cash. Managing their debts was therefore a challenge for some businesses.

Government and policy environment

Responsibility and authority for sanitation at the national level lies with the Ministry of Health, however at the local level, commitment to improving hygienic latrine coverage varied. In Muong Ang and Mai Chau where SNV had worked at the provincial, district and commune level, there was some degree of commitment; however this was hampered by budgetary allocations to sanitation which relied upon provincial decision makers.

Support for private enterprise was also present at the national level (however a policy is still lacking), including support for enterprise engagement in sanitation. It remains to be seen how this support will flow to sub-national levels of government where much of the decision making power lies, and hence the reality for businesses depends on the provincial interpretation of national support.

5.2 ACTIONS TO OPTIMISE THE VALUE-CHAIN

The results from this research in Muong Ang and Mai Chau districts illustrate the major increase in the cost of latrines due to transport and distance. As well as the barrier of cost, there is also the practical barrier in physically transporting the materials to remote households with highly challenging logistics. The time and effort required to move bricks, cement and other heavy items where bulk transport (i.e. trucks) cannot access should not be overlooked. Additionally, the high proportional cost of bricks compared to other core material components for latrines show that making a difference to the costs of latrines will involve investigating alternate materials (e.g. concrete rings— however logistical challenges relating to transport cannot be overlooked here either). These results have implications for the ways to support or subsidise costs for the poorest households, however this would need to be carefully managed due to toilet materials being common construction materials.

More specific strategies to overcome the challenges highlighted in this research are presented below.

Access to finance for customers: Approaches that can reduce the outlay for such households, including better managed loans from VBSP with facilitation assistance from mass organisations, may help poor households to access sanitation. Gero and Willetts (2014) noted how VBSP loans had mixed degrees of uptake across rural provinces, in part due to the poor's awareness of the loans, how well the loans targeted poor households and also if and how the mass organisations played a facilitation role. Strengthening the VBSP loan programs such that they do provide an effective means through which the poor can access finance for sanitation could overcome some of the challenges faced by poor households in paying for sanitation.

Organising communities for collective purchasing: Communities could be encouraged and supported to buy materials as collectives to reduce costs. Both community leaders and government staff could promote this approach, and apply incentives (such as time-bound financial support) to support development of momentum and action. However, while households collectively organising bulk purchases of goods may work in village or commune centres where trucks can deliver bulk purchases, in remote locations this would not work, as access is limited to motor bikes and on foot.

Targeting transportation of sanitation materials: The results from this research in Muong Ang and Mai Chau districts illustrate the major increase in the cost of latrines in remote locations is due to transport and distance. As well as the barrier of cost, there is also the practical barrier of arranging the physical transportation of the materials to remote households with highly challenging logistics. Government estimates of latrine costs are far below the costs households in this research are required to pay in reality. This is seen in

Table 10 and Figure 49. Targeted government subsidies for this specific case (i.e. transporting sanitation products to remote locations) could be developed to assist in removing this barrier. Blanket forms of support across Vietnam's provinces, even if targeting the poor, are not appropriate as the challenges (and related costs) in mountainous, remote locations are not present in the coastal plains. Furthermore, investment in sanitation marketing or market based approaches is unlikely to increase access to hygienic sanitation for remote households unless additional support is provided which addresses transport and logistical challenges at the same time.

Target bricks as the most costly component of toilet costs: The high proportional cost of bricks compared to other core material components shows that influencing the cost of latrines may involve investigating alternate materials, such as concrete rings – however logistical challenges relating to transport cannot be overlooked here either. In some locations moulds for making concrete rings have been shared for use by communities and could help overcome some aspects of the logistical challenge.

Reconsider appropriate technology and design: Further effort should be directed to research and innovation concerning design of toilets suitable for remote, difficult to reach locations. Models that incorporate light-weight materials in place of heavy construction materials, as well as designs that specifically use locally available materials, both require greater investigation. In addition, more detailed review of soil types and matching soil type to latrine design may support reduction in the overall quantity of materials required for a durable, stable latrine. An outcome of such work may be a broader range of 'standard' toilets (beyond MoH's current set of designs) that take into account the situation in remote, rural locations.

Improve community understanding of hygienic sanitation options: In remote villages, households had limited awareness of the types of sanitation options that were available. There were cases of wealthy households building expensive septic tank latrines with bathrooms, and this may have been the only example what hygienic sanitation looks like for poorer households. Local government and CSOs, together with Women's Union staff could therefore work to raise the understanding of poor, remote households of the various more affordable types of sanitation that are available.

Smart targeted subsidies: Given the need to support the poor, thought must be given to how to address affordability concerns, whilst avoiding undermining private sector actors (sanitation entrepreneurs and materials supply shops) by providing non-targeted subsidies. In many countries, the need to develop 'smart' subsidies has been discussed (and in some cases trialled) to look to overcome this inherent tension. Design of a 'smart subsidy' involves considering issues in the local context in choice of subsidy, and 'designing-in' mitigating strategies for any disadvantages. Some subsidies involve partnerships or contracts with supply shops, and require several steps in their development to ensure equitable participation of supply chain actors and ensure agreements are transparent and upheld. In some other country contexts methods to 'accredit' certain suppliers have been adopted, involving suppliers agreeing to criteria around product quality, amenability to bulk delivery, price guarantees and guarantees to only provide services to eligible households.

Various types of subsidies and supporting options have been assessed elsewhere, and are included below (see Table 12) as they offer potential options for the situation in rural and remote locations in Vietnam too.

Table 12: Types of subsidies (adapted from Evans et al., 2009 and Tremolet et al., 2010)

Subsidy type	What does it involve?	Advantages	Disadvantages	Example of its use
Direct subsidy – cash or vouchers	Payment direct to targeted households as cash or voucher to be spent on specified sanitation products or services	Empowers targeted households Stimulates market development	Expensive and complex to administer, potentially causing issues for scalabilty Potentially only viable when bundled with other social services	Vouchers have reportedly used within a program at scale by BRAC in Bangladesh however not evaluation is available concerning the results.
Hardware subsidy	Public sector (or NGO) provision of sanitation products to targeted households, usually with some input (cash/labour) from households	Enables targeted poor households access to sanitation	Often expensive with limited reach, not financially sustainable Stifles market development Can skew or fix technical design at 'high-cost' end	Bangladesh DISHARI: upfront in-kind hardware subsidy targeted to poor (covering 42% of hardware costs)
Subsidies to small-scale suppliers / services	Funding for training, product development business development services (for artisans and/or suppliers), providing credit or moulds or transport subsidies, could reward sales to the poor	Potential to support affordable products for all (not just targeted households) Supports broader market approach	Relies on interest and capacity of small-scale providers May have a slow effect where private sector development is limited Risk of failure of some providers resulting in lost investment	Mozambique Improved Latrines Program: software support to suppliers and output-based subsidy for each toilet or slab sold (40-60% of hardware costs)
Cross subsidies	Transfers in cash or labour from richer to targeted poor households	May be efficient at targeting and allocating resources	May still result in exclusion of some poor and vulnerable	
Output-based subsidies	Subsidies paid after an outcome is achieved (e.g. ODF, toilet use etc.)	Prevents wastage of public money Encourages efficiency and accountability	Investments must be pre-financed and this may exclude the poor Complex to administer	Maharashtra, India Total Sanitation Campaign: outcome-based hardware subsidy for poor households (covered 22% of hardware costs)
Subsidised credit	Bank guarantees or low interest loans to poor households	Supports market development	Requires competent micro-finance providers Can be complex to administer	Vietnam Sanitation Revolving Fund; access to credit at subsidised interest rates on loans for hardware (accounted for 3% hardware costs)

Finally, given the evidence that locally produced or sourced materials can reduce costs (as is the case for sand in Muong Ang) another option includes building toilets out of local materials. While some transport costs are likely to still be necessary, if materials are locally sourced then their actual price at point of production will reduce the overall cost for households.

6 CONCLUSION

The findings from this research highlight the need to understand the various factors contributing to the cost and uptake of hygienic sanitation in specific rural and remote areas. In Muong Ang and Mai Chau Districts in Vietnam, low hygienic latrine coverage corresponded to both high levels of poverty and high costs of toilets (with a higher correlation for Muong Ang). Low hygienic latrine uptake was not the result of non-existence of supply chains, as materials to build toilets were commonly available in all district towns and commune centres. Rather, it was challenges associated with transport that posed significant barriers to remote households in accessing even simple sanitation options. While transport costs were high, it was the compounding logistical challenge of physically moving the materials by motor bike or on foot that posed the major barrier. Households needed to invest considerable time using their private motor bike (or employing local labourers) travelling to- and fro- and along difficult roads or paths multiple times to carry loads of cement, sand and bricks to their household. Results show that it would not be realistic for households to undertake this task for some latrine types, as the number of trips required was 42 for a VIP latrine (potentially possible) and 229 for a septic tank latrine (which is unrealistic).

The total cost of materials varied between the two districts, partly as a result of the local availability of sand in Muong Ang which reduced costs significantly. Variations in the cost of bricks (which comprised the highest of all material costs) also contributed to the differences in material costs between the two districts. The influence of these locally sourced materials on cost (as for sand in Muong Ang) and high cost of bricks and provides an indication of where to focus efforts to reduce overall costs, and where alternate materials may be used (e.g. concrete rings).

Assessing other elements of the supply chain revealed that costs of materials at supply shops are already optimised, in that very low profit margins are accepted by shop owners and payment by credit is commonplace.

Supporting poor households in locations such as Muong Ang and Mai Chau will therefore require careful and considered approaches that tackle the specific challenges in various locations. Blanket-type approaches to support sanitation across Vietnam's provinces, even if targeting the poor, will not effectively address the challenges in mountainous, remote locations are not present in the coastal plains. Furthermore, sanitation marketing or market based approaches are unlikely to increase access to hygienic sanitation for remote households unless specific consideration of the best ways to address transport, elevated costs and logistical challenges.

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