

# SUPPLY CHAIN ANALYSIS ON SANITATION AND HYGIENE: HOW CAN WE IMPROVE DEMAND AND SUPPLY CHAIN BARRIERS IN RURAL DRY ZONE AREA OF MYANMAR?

Aung Myat Khaing<sup>1\*</sup>, Ali Ameen<sup>2</sup>, Osama Isaac<sup>3</sup>

<sup>1</sup>Lincoln University College, Malaysia.

<sup>2,3</sup>Faculty of Business and Accountancy, Lincoln University College, Malaysia

\*Corresponding Author's Email: amk.ginga@gmail.com

## ABSTRACT

Access to Basic Services to vulnerable communities are key priorities for Local Government under the National League for Democracy led Myanmar Government Since April 2016. Regarding the research gaps for Myanmar, the study defines to identify possible business models, interventions and support services which have the potential to improve the availability of affordable sanitation products and services to rural low-income households.

This study was employed in mixed method. Data collection components were conducted using qualitative research techniques particularly Key Informant Interviews (KII) and focus group discussions (FGD) with farmers, traders, processors, masons, service providers, and representatives from the respective areas and supply chain linkage in the geographical locations. Semi-structured household-based and services-based questionnaires will be developed and interviewed to 54 household and explore questions relevant to their demand and opinion on their current practices and usages of sanitation and hygiene utilities.

The study results will be helpful for promoting rural sanitation and hygiene products and services in dry zone areas. It will critically inform the design of interventions to support strengthen market-based solution and pro-poor support mechanisms such as Sanitation Demand Creation, Behaviour Change Communication, and disability and gender integration.

**Keywords:** *Water, Sanitation, Hygiene, Supply Chain*

## INTRODUCTION

The former opposition party, the National League for Democracy (NLD) won in a landslide victory and now holds an absolute majority in both upper and lower houses of the Hlutaw (Myanmar Parliament). Thus, new Myanmar Government has inherited a country in transition. Among these transition process, social, education and Primary healthcare transforming processes are key priorities for the National League for Democracy led by the government since April 2016.

The supply chain analysis will critically inform the design of interventions to support and strengthen market-based solution and pro-poor support mechanisms in the Study location in Nyaung U Township. It will inform activities undertaken as part of the Rural Supply Analysis on Hygiene and Sanitation Programme components such as Sanitation Demand Creation, Behaviour Change Communication, and gender integration. Based on the situation analysis of PLAN International in Myanmar, access to improved water supplies was estimated at 86 percent nationally, though access in rural areas is estimated to be slightly lower at 81 percent. Of the latter, 3 percent have piped

water supplies and 19 percent drink from unimproved water sources. While national improved sanitation coverage is reported at 77 percent, with an additional 13 percent using shared facilities, sector experts generally regard official Myanmar WASH access figures (including the MICS and JMP data) to be over reported. Similarly, reported figures of rural improved sanitation coverage of 74 percent, 14 percent share facilities, and 7 percent open defecation, should be used with caution. The assessment study state that 64.1 percent, used latrine with good sanitary condition. Half of the respondents disposed of children's faces in the latrine and 1 in 5 household threw trash into the dry stream. With regards to sanitation and health, mothers reported that outbreak of diarrhoea occurred 2 times a year, once in April (Summer period in Myanmar) and another in July and August (Monsoon period in Myanmar). They perceived that diarrhoea outbreaks were caused by shortage of water and availability of many fruits. Low sanitation coverage and the associated health impact in the target villages requires a focused sanitation and hygiene approach. Hygiene is proven to be the most effective method of reducing diarrhoea for WASH approaches, followed by sanitation and lastly water

(Bamford & Scharp, 2016). Increasing water provision does not automatically translate into improved hygiene practices and health outcomes.

### **Objectives**

The overall objective of the study is to conduct a diagnostic of the rural sanitation supply and value chain in distinct physical and market environments, demand and requirement of related products focusing on the commonly found or most preferred products and services for improved sanitation in rural Myanmar (including below ground and above-ground sanitation facilities).

The specific objectives were-

1. To explore the function and map of the current sanitation of the supply chain by making a profile of the different key players in the sanitation supply chain (products, services, activities, profitability);
2. To explore the existing gaps in the supply chain, consumer preferences, and level of current consumer satisfaction of current sanitation goods and services includes the ability for the current supply chain to reach and accessed by the most vulnerable in the 8 project communities such as People with Disability, female-headed households and elder people;
3. To utilize the findings of study for establishing supply chain models of common use products and services that reach the rural poor and marginalized groups to provide recommendations on sanitation of supply chain distribution.

### **LITERATURE REVIEW**

**Supply Chain** is the combination of organisations, people, activities, information and resources required to create a product or service and move it from supplier to customer. Supply chain entities typically include suppliers, producers, transporters, wholesalers, retailers and consumers.

#### **Structure of WASH Industry**

WASH industry is quite complicated and composed of different sectors, several entities, and different supply chains. In general, there are three main components in WASH industry as-

- 1) Water Access
- 2) Toiletry
- 3) Hand Washing, Sanitation and Hygiene products.

Under Water Access, there are two subcomponents- Clean water (rainy & dry season) and Drinking water.

Related to Toiletry, there have sub supplies such as PVC pipe, iron sheet, pen, slab/concrete, bamboo/wooden, bricks, and construction materials like as Mason, Carpenter as human resource. The sanitation and hygiene products, such as Detergent, Soap, Shampoo, Toothpaste, Hygiene products are essential part of supply chain.

#### **WASH Programs**

WASH is the collective term for Water, Sanitation and Hygiene. Access to clean water is very important for public health issues. More than 97% of the total water sources of the world is salty water and there is nearly 3% of the total water source can be used for human, animals and agricultural production. If people say water is life, sanitation is the backbone of the lives. Water, Sanitation and Hygiene (WASH) is the basic needs of people. Increasing access to Water, Sanitation and Hygiene (WASH) is central to meet the global development goals. However, access to improved sanitation is still a major challenge in developing countries. The major challenges are-

- 1) Changing behaviours towards adopting improved sanitation practices, and
- 2) Providing a supply chain of services and materials for building latrines for the rural population.

#### **Safe Water Access**

In Myanmar, there are several water resources; more than 19,000 m<sup>2</sup> per capita each year, which is about 9 times the available levels in China, 16 times India, 5 times Vietnam and 16 times Bangladesh (Netherlands Embassy in Bangkok and Netherlands Economic Mission in Yangon, 2015). According to the report of the Ministry of Health and the Ministry of National Planning and Economic Development, overall 82.3% of the population use an improved source of drinking-water, 93.2% in urban and 77.6% in rural areas.

#### **Sanitation and its related Hardware**

Methods used for safe and sustainable management of human excreta including the collection, storage, treatment and disposal of faecal matter. The hard or physical infrastructure (e.g. latrines, wastewater treatment facilities, sanitation platform) which make sanitation services possible.

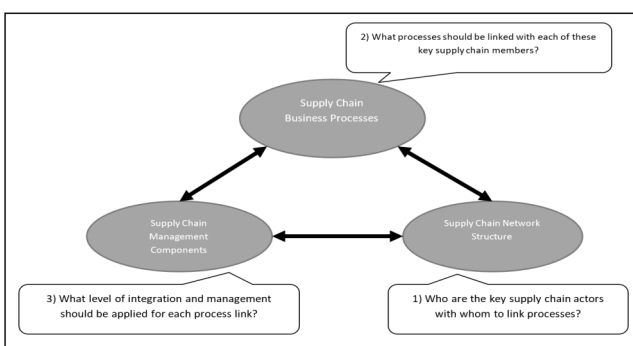
### **RESEARCH METHODOLOGY**

This supply chain analysis is an analysis of the rural sanitation supply and value chain in distinct physical and marketing environments. It focuses on the commonly found or most preferred products and services for

improved sanitation in Nyaung U Township, Myanmar. This study started from 5<sup>th</sup> June 2018 until the 27<sup>th</sup> June 2018 especially for developing questionnaires, interview guidelines are required for field arrangement. The data collection process took for 10 days including conduction of a half day workshop with field team which was conducted after the data collection as sharing the findings and recommendations for the finding and future strategy for supply chain development process of this project.

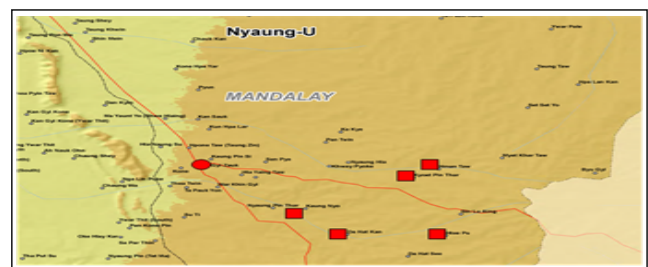
The study analyses the opportunities, issues, constraints (including market and non-market impediments) and potential risks with the current supply chain and its capabilities, particularly in reaching the base of the pyramid. It also maps existing actors and stakeholders, up and down the supply chain of sanitation goods and services and the relationships between them. The study aims to identify possible business models, interventions and support services which have the potential to improve the availability of affordable sanitation products and services to rural low-income households. The findings – along with the separate study of consumer behaviour – will inform the Government's national sanitation marketing and behaviour change communication strategy and implementation plan (refer to figure 1). This study was employed in mixed method and more focus to qualitative methods. An initial desk study was conducted to collect and summarize the information from currently available reports and studies. It has provided guidance to issues that needed to be the focus of the field research. To correspond to the study design, this study employed more focus in qualitative method data collection. As the initial learning process, limited timeframe and resource, study applied qualitative tools and this type of study can contribute to the development of comprehensive survey instruments and generate hypothesis about association that can be tested in future quantitative studies (Vaismoradi, Turunen & Bondas, 2013; Ritchie, Spencer & O'Connor, 2003) stated that qualitative method are also useful “to understand the meanings which people attach to phenomena (actions, decisions, beliefs, values etc.) within their social worlds”.

**Figure 1: Concept for Supply Chain**



In qualitative data collection, the existing actors and stakeholders, up and down the supply chain of sanitation goods and services and the relationships between them (from households, to suppliers (local and international) and manufacturers of raw materials. Mapping also included the existing business environments in the sanitation supply chain, identified possible business models and support services, which have potential to scale up the availability of aspirational and affordable sanitation products and services to rural low-income households. As additional the study finds out existing gaps in the supply chain, consumer preferences, and level of current consumer satisfaction of current sanitation goods and services. This also includes the ability for the current supply chain to reach and be accessed by the most vulnerable in the 8 project communities (e.g. Female-headed households). Combined with results from the consumer research (to be undertaken and procured separately), insights from this supply chain analysis will assist the Plan Myanmar Organization, Government and its partners to develop an evidence-based sanitation marketing and communication strategy aimed at improving rural sanitation at large scale. The field work component of data collection was conducted using qualitative research techniques particularly Key Informant Interviews (KII), small group meetings, and Focus Group Discussions (FGD). Key informants and participants to the meetings and FGDs consisted of farmers, traders, processors, masons, service providers, and representatives from the respective project areas and supply chain linkage geographical location such as Kyaukpadaung Township which is neighbour township of Nyaung U Township. A focus group is a planned, facilitated discussion among a small groups of stakeholders designed to obtain perceptions in a defined area of interest in a permissive, no-threatening environment (Campbell, 2008). Semi-structured household-based and services-based questionnaires were developed and conducted for quantitative data collection. 54 household were visited and interviewed relevant to their demand and opinion on their current practices and usages of sanitation and hygiene utilities. See the study location in figure 2 study team visited to 6 villages of in Nyaung Oo Township.

**Figure 2: Map of Field Study Locations**



**RESULT AND DISCUSSION**

Regarding the KAP Report, information on water and sanitation conditions is required for assessing the health situation of the population as well as assessing the fulfilment of basic needs. Moreover, they composed as an important component for construction of the Wealth Index. Sources with better protection from contamination included brick-lined well, borehole, hand pump, protected pond and rainwater collection tank. By comparison, sources with no or little protection from contamination included well with no wall, pond with no fence or protection, stream, river and others (KAP, 2016).

**Water, Sanitation and Hygiene**

The table 1 shows the utilization of water sources for each of the three seasons. In the rainy season, 51% use the rainwater and 43% use the surface water. In the winter season, 29% use the tube well/ Borehole for drinking water and 52% use surface water. In the summer season, 65% use the tube well/ Borehole for drinking water and 21% use surface water. Overall, 32% of respondents use the tube well/ borehole and 39% use surface water for drinking.

**Table: Households using improved drinking water sources in all seasons**

	Drinking water							
	Rainy		Winter		Summer		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Piped water into dwelling	1	0%	0	0%	0	0%	1	0%
Tube Well/Borehole	12	4%	104	29%	218	65%	334	32%
Protected dug well (Brick-lined well)	1	0%	0	0%	0	0%	1	0%
Rainwater collection	174	51%	29	8%	6	2%	209	20%
<b>Improved water source</b>	<b>188</b>	<b>55%</b>	<b>133</b>	<b>37%</b>	<b>224</b>	<b>66%</b>	<b>545</b>	<b>53%</b>
Cart with small tank/drum	2	1%	20	6%	22	7%	44	4%
Tanker/Truck	0	0%	5	1%	4	1%	9	1%
Surface water (river, dam, lake, pond, stream, canal, irrigation)	147	43%	186	52%	72	21%	405	39%
Other	2	1%	13	4%	15	4%	30	3%
<b>Unimproved water source</b>	<b>151</b>	<b>45%</b>	<b>224</b>	<b>63%</b>	<b>113</b>	<b>34%</b>	<b>488</b>	<b>47%</b>
<b>Total</b>	<b>339</b>	<b>100%</b>	<b>357</b>	<b>100%</b>	<b>337</b>	<b>100%</b>	<b>1033</b>	<b>100%</b>

Source: KAP Survey Report, Htee Pu WASH Project, Jan 2017

The table 2 below shows the utilization of water sources for each of the three seasons. In the rainy season, 50% use the rainwater and 44% use the surface water for kitchen usage water. In the winter season, 33% use the tube well/ Borehole for kitchen usage water and 50% use surface water. In the summer season, 71% use the tube well/ Borehole for kitchen usage water and 18% use surface water. Overall, 36% of respondents use the tube well/ borehole and 37% use surface water for kitchen usage water. Emergency water source of household about 64.5% of the respondents said they have difficulty in getting water for drinking or for kitchen/ general use. Type of latrine was categorized into two: fly proof; and

non-fly-proof. Fly proof type consisted of fly proof latrine and direct pit latrine. Non-fly-proof type comprised latrine with no pit or no cover, defecating in bushes and other types. It was discovered that most households, 64.1 percent, used latrine with good sanitary condition.

**Table 2: Households using improved water sources for kitchen usage in all seasons**

	Water for kitchen							
	Rainy		Winter		Summer		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Tube Well/Borehole	14	4%	112	33%	244	71%	370	36%
Rainwater collection	165	50%	24	7%	1	0%	190	19%
<b>Improved water source</b>	<b>179</b>	<b>55%</b>	<b>136</b>	<b>40%</b>	<b>245</b>	<b>71%</b>	<b>560</b>	<b>55%</b>
Cart with small tank/drum	2	1%	20	6%	22	6%	44	4%
Tanker/Truck	0	0%	5	1%	4	1%	9	1%
Surface water (river, dam, lake, pond, stream, canal, irrigation)	144	44%	171	50%	61	18%	376	37%
Other	2	1%	11	3%	13	4%	26	3%
<b>Unimproved water source</b>	<b>148</b>	<b>45%</b>	<b>207</b>	<b>60%</b>	<b>100</b>	<b>29%</b>	<b>455</b>	<b>45%</b>
<b>Total</b>	<b>327</b>	<b>100%</b>	<b>343</b>	<b>100%</b>	<b>345</b>	<b>100%</b>	<b>1015</b>	<b>100%</b>

Source: KAP Survey Report, Htee Pu WASH Project, Jan 2017

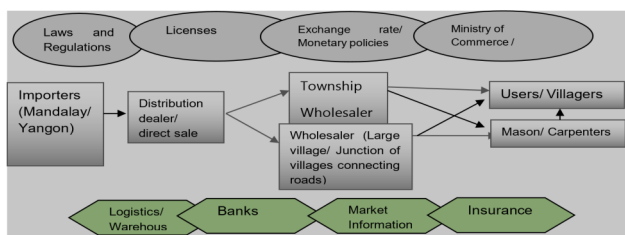
**Private Sector in Sanitation**

Refers to individuals and organizations that provide goods and services required for construction of sanitation facilities. These are traders, markets or shops, manufacturers, contractors, transporters and others. Sanitation goods are materials and products. Sanitation services are technical knowledge/skills, transport etc. required for construction of sanitation facilities.

**Supply Chain Mapping**

**Toiletry:** Overall, the sanitation supply chain in Nyaung U participated with many wholesalers/retailers, concrete producers and masons in Nyaung U, Kyauk Pa Daung and Byat Ta Lan Sone (Large Village market). Main goods produced within the area are iron sheet, iron, PVC pipes, toilet bow and pan, etc. mainly imported from China. In this regard, the actors involved in the supply chain of Toiletry are importer of construction materials including toilet kits in Yangon and Mandalay Regions, Wholesalers and retailers in the market, concrete ring producers, mason/ carpenter and of course the end users. The figure 3 shows the Supply Chain Map of Toiletry Products.

**Figure 3: Supply Chain Map of Toiletry Products**



**Importers:** The major importers of construction materials and toilet kits are operation business from Yangon and Mandalay Regions. The study did not cover at national level and we cannot explain much about importing procedures and market functions at importers level. Many products have been imported from China and Thailand.

**Manufacturers:** Most manufacturers of components for latrines are in Thailand, China and Vietnam (only small in Town Use). There are three Myanmar manufacturers of cement (one is state-owned). Sand and gravel are produced locally. We are not aware of any local manufacture of latrine pans. As a result, there were no in-depth interviews with manufacturers. However, the team had an unstructured interview with some of the manufactures.

**Soap Producers and Distributors:** All the companies of Soap and Detergent (Washing Powder) are Myanmar Nationally Owned having Joint Venture with Chinese and European Companies as their raw materials are importing from China and Thailand. All the packaging was done locally inside Myanmar mostly in Yangon Factories and Mandalay Warehouse. One company is producing more than 1 or 2 brands in Soap distribution and marketing, but the quality may be different based on range of price. All the companies are based in Yangon and hiring an agent for their distribution and creating marketing channels via distributors from their targeted areas and sending sale and marketing team from their Yangon Head Offices.

**Construction materials importers and suppliers (wholesale and retail):** Importers/wholesalers are businesses that import construction materials (e.g. cement, ceramic pans, PVC tubing, Iron-Zinc Sheet, etc.) from outside Myanmar and within Myanmar for wholesaling. There are some wholesalers in those locations, but they are more targeting to Town Level Construction Sides and Government Projects from Hotel Zones. Retailers are shopkeepers in urban (Nyaung U and Kyauk Pa Daung) or rural markets (Byadta Junction and Large Villages) who sell construction materials, including latrine components, Hygiene Material, Cosmetics, usually directly to consumer households. Latrine related products are generally a small part of their product range and income. Some importers are not in the provincial capital but are in towns close to the Mandalay and Kyaukpadaung Town.

**Wholesalers/Retailers:** Sell toiletry products together

with construction products such as iron, iron sheet, iron/steel iron rope. There are about 3 large shops in Nyaung U. Their business experience was 3-4 years to over 30 years. They supply construction materials from Yangon/ Mandalay wholesale markets. Normally, they use to buy those materials at least once a week but largely depend on the turnover. Turnover of these products is higher in dry and winter season while it is lower in the rainy season since people are emphasizing on farming. Markets for construction commodities of rural latrines are easily accessible and safe throughout the year, although price changes up to 10-20% of some commodities over the last 12 months (Price changes also depend on the currency exchange rates). Moreover, price difference between markets are minimal (wholesale vs retail + associated transport cost, middlemen fees and labour charge). Credit system available in some places, most of the wholesalers/retailers sell in cash.

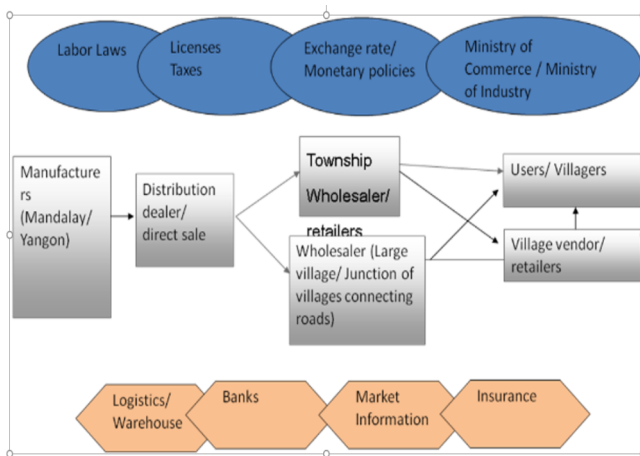
**Concrete ring/Tank Producers:** Concrete pits are produced locally (in township level). There are 3-5 competitors in Nyaung-U doing the same business. They supply cement and lime from Mandalay. The most utilized cement brands are Kyant Hna Kaung, Sin Min (Royal Elephant), Tiger Head, Alpha. Lime is supplied from Mandalay whereas Sands and stones are bought from nearby places, getting sand from the river and streams nearby is prohibited.

**Mason/Carpenter:** A mason/carpenter is one important actor in WASH supply chain linking the construction material suppliers, concrete producers and end consumers for the latrine requirements. However, nearly all material suppliers reported that they have at least some sales direct to households. Masons/ Carpenters use to build the latrines they build as a part of the construction of a new house. The mason must work with the household to identify the optimum spot and some of them have linked with construction materials shops. They just learnt from the experiences and they must employ as unskilful causal labour. Working days and assignments always depend on the condition. The leader gets about 10000- 15000 kyat per day, but the followers get 5000- 8000 kyat based on their skills.

### **Hand Washing, Sanitation and Hygiene Products**

Actors engaged in hand washing, sanitation and hygiene products are manufacturers, importers, wholesalers/dealers, retailers including village vendors. The figure 4 shows the Supply Chain Map of Sanitation and Hygiene Products.

**Figure 4: Supply Chain Map of Sanitation and Hygiene Products**



**Local Manufacturers:** Local manufacturers engaged in making soap, synthetic organic detergents, inorganic alkaline detergents, and crude and refined glycerine from vegetable and animal fats. Europe & Asia Co., Ltd is one of the largest manufacturers and distributors personal care products (Elan/Eco detergent, Cool toothpaste). Shwe War (bar type) soap is produced in Mandalay and Yangon (Yangon's production quality is better) and supplied to Nyaung-U wholesalers/ grocery stores. Manufacturers supply products directly or through the dealers to the Township wholesaler. They used to deal with discount/promotion systems to the wholesalers. They supply in both cash and rotate delivery and payment terms.

**Wholesalers:** Wholesalers supply various kinds of soap, detergent, shampoo, toothpaste, etc. directly from the manufacturers through company's direct sales. Depending to the turnover of the wholesalers, they distribute 2-3 days intervals to one-month interval. Wholesalers are mainly based in town/urban areas. The major outlets for these personal soaps, detergents, shampoo, toothpaste, etc., are supermarkets, discounters, drug stores and wholesale shops nearby wet markets. Supermarkets have the largest share since recent years supermarkets being important outlets for skin-care products and wholesale & retail sales. Sanitation products are always in demand if it is affordable.

**Retailers:** Retail prices are not much different with the prices in township and rural markets with difference in transport cost. Most of the households use to buy directly from the wholesalers but they buy from the retailers in the village only for urgent needs. Because, retailers in the villagers sell these products as a part of households' goods and products and there are not many choices for the users.

**Market Trend:** The sanitation market has been growing over recent years. There is more competition among material suppliers than concrete producers and mason/carpenters. Competitive prices of sanitation products in different markets have been summarized in the table 3. All the interviewee including the different actors responded that latrine construction has been increasing. Different brands of soap, shampoo, toothpaste have been entering in the markets. However, sale volume of the interviewed wholesalers and retailers has not been increasing but the number of shops has been increasing in towns and rural villages. Construction materials' wholesalers mentioned that sales of latrine products have been increasing. Mason and carpenters also responded in the same way. Increased demand for sanitation products is largely related to the growth of population, increasing income of the people, better road and communication facilities, improved health knowledge as well as support of the NGOs for public health. Regarding the categories of latrine, demand for better quality pan has been increasing. However, from the rural areas, the most demanded pans are plastic pans and PVC. According to the discussions with village leaders and Key persons, only 5% of the total households have latrine in recent two-three years. The soap and personal product market are also being driven to a large extent by the changing age composition of the population; baby, teen and elders. Special products for skin care have also been increasing in demand.

**Table : Price Comparison of sanitation products in the study areas**

Product	Sale Price in Nyaung Oo	Sale Price in Byat Ta Junction	Village
1.ELAN (powder)	300 kyat/ pc	300 kyat/pc	350 kyat/pc
2. ECO (powder)	90 kyat/pc	95 kyat/ pc	100 kyat/pc
3. WIN (powder)	90 kyat/pc	95 kyat/ pc	100 kyat/ pc
4. FUJI (400 g, cream)	550 kyat/ pc	600 kyat/ pc	Not available
5. Life Boy Soap (Bar L)	450 kyat/ pc	450 kyat/pc	500 kyat/pc
6. Family Care (Bar L)	459 kyat/ pc	450 kyat/ pc	500 kyat/ pc
7. Signal toothpaste @	600 kyat/ pc	-	700 kyat/pc
8. Laser toothpaste (L)	400 kyat/ pc	-	500 kyat/pc

**CONCLUSION**

This study will be helpful for promoting rural sanitation and hygiene products and services in dry zone areas. It will critically inform the design of interventions to support strengthen market-based solution and pro-poor support mechanisms such as Sanitation Demand Creation, Behaviour Change Communication, and disability and gender integration. The study implies that

the research did not reach the most rural communities but only those rural communities with at least one supply chain stakeholder.

## RECOMMENDATION

Based on the reflection results and experience of the study team in Dry Zone, Myanmar, the project designing, implementing and monitoring market-based approaches to generate measurable improvements in healthy behaviors including use of hygienic sanitation, the following suggestions are provided consistent with promoting the Sanitation and Hygiene Market Development-

### *Improve convenient availability to sanitation and hygiene materials by –*

- Developing locally specific sanitation market maps
- Coordinating with hygiene or sanitation market players in related locations
- Conducting policy research related to Tax or VAT exception for Sanitation and Hygiene items importing or productions by the Host organization at the national level.

### *Increase access to skilled masons/volunteers/hard labour/carpenter*

Capacity of building quality and locally appropriate latrines by:

- Training masons; volunteers - Providing additional support to increase sanitation-specific business for trained masons or carpenter.

### *Address price barriers for rural consumers*

- Facilitating bulk transport of heavier materials to select areas to reduce transportation costs;
- Encouraging retailers to stock and masons to use less expensive but appropriate materials;
- Depending on latrine model specifications, developing user-friendly guidelines to help consumers “do-it-yourself” (part or all, depending on latrine type).

### *Facilitation rather than delivery*

- It is rare to have all the resident expertise that can aid with a diverse set of constraints or training for a wide range of competencies. Furthermore, investment in program delivery personnel and assets makes it more difficult to react proactively to changing market demands. A facilitation role that can utilize a coordinating position in the supply chain would

therefore be more consistent with market-based and sustainability principles. It enables government or its development partners to work more effectively with private sector organizations in the delivery of services.

## LIMITATIONS

The research team did not reach the outside project villages in very remote villages because in these villages supply chain actors are not present and interviewing poor households was not in the project scope. This implies that the research did not reach the most rural communities but only those rural communities with at least one supply chain stakeholder. However, actors were asked about the location of their customers and their ability to serve remote rural areas. Finally, the research location did not include the whole supply chain. For example, manufacturers and suppliers in China, Thailand and Myanmar Border Trading Area except Yangon City were outside the geographic scope of the project, yet these businesses are an important part of the chain. Also, construction material suppliers in Magwe and Muse (and some other towns) play a role in the supply chains studied but these were not in the selected research districts. The data may also suffer from selection bias. Those above-mentioned interview actors who were prepared to be interviewed may not be representative of the population. However, it is not clear in what direction this bias might affect the data. Some actors refused to be interviewed (some citing that are too often asked questions by sanitation programs) and some of these tended to be larger suppliers.

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