

PROSPECTS FOR LEVERAGING PRIVATE SECTOR LOGISTICS FIRMS TO SUPPORT RURAL ACCESS TO HEALTHCARE: SOME INSIGHTS FROM MOZAMBIQUE

J Beale, M Mashiri¹ and J Chakwizira²

VillageReach Organisation, Seattle, United States of America, Cell: 1.206.755.0145 Email address: john.beale@villagereach.org

¹GTRD, 25A Barnstable Road, Lynnwood Manor, Pretoria 0081, Email: macmashiri@telkomsa.net Cell: +27 72 122 9394

²University of Venda, School of Environmental Sciences, P/Bag X5050, Thohoyandou, 0950, South Africa; Tel: +27 (0)15 962 8585; Fax: +27(0)15 962 8587; Email: james.chakwizira@univen.ac.za, jameschakwizira@gmail.com

ABSTRACT

For many rural communities across southern Africa, access to even the most basic healthcare is not guaranteed. Competing demands by public sector agencies for limited transport resources, plus poor vehicle maintenance standards, prevent public health system motor pools from being available consistently to reach health centers on a regular basis. The irregular availability and use of transport also results in higher overall costs of distribution of medical commodities due to vehicle breakdowns, higher rates of product wastage, and higher personnel costs per successful delivery. As a result, medical commodities including vaccines and essential medicines are not provided reliably or in sufficient supply, needlessly impacting the health of these communities. This paper reviews current transport practices within the Ministry of Health (MISAU) and highlights existing trends in commercial transport with a view to presenting considerations in which the two sectors could collaborate to achieve improved reliability and increased efficiency of the distribution of medical commodities.

A mixed method approach was employed to gather, review and process information. The field research was conducted from September to November, 2013 as well as from January to February 2014 – before and after the onset of the rains. The research findings indicate in the main that MISAU recognizes the mounting challenges it would face in continuing to support the current model – and the missed opportunities to broaden access to healthcare. In response, it is pursuing a path of decentralization and private sector engagement in order to capture and realize greater efficiencies and develop a more sustainable and equitable path for improvement.

Key Words: Mozambique, healthcare delivery outcomes, healthcare commodity freight logistics, rural healthcare access, private sector transport

1. INTRODUCTION

1.1 Background

For many rural communities across sub-Saharan Africa, access to critical healthcare services often goes unfulfilled. Where rural healthcare opportunities exist, both the facilities and the capacity of the personnel assigned to them are often insufficient to meet community demands. In addition, operating these facilities is fraught with many challenges, namely:

- Most operate off-grid and require alternate fuel supplies to support lighting, refrigeration and sterilization
- Health workers assigned to these posts not only work long hours serving patients, but they are often required to undertake additional support activities beyond administering care, including the collection of medical commodities from district depots especially given the unreliability of supplies, and
- Many healthcare centres are located far from district storage facilities, and are only accessible via unpaved roads that are challenging to navigate and require many hours to reach, particularly during the rainy season.

While there are many influencing factors on delays in the distribution and stock outs of critical medical commodities, insufficient transport is certainly a significant contributor. In Mozambique, of necessity, transport is a critical component of healthcare provision, owing to its vast spatial geography. This is exacerbated by the unbalanced hierarchy of settlements – lacking intermediate nodes providing high order commodities such as medicines, as well as the massive transportation infrastructure backlogs.

Mozambique has approximately 17.5 million living in rural areas, based on an estimated 69% share of the country's total population (World Bank, 2012). The country has seen rising levels of economic activity within the last decade due to the discovery of large reserves of natural gas and increasing mining activity in the north. Because of this economic stimulus, and owing to its unique geographic position as an export access corridor for many countries in the Southern African Development Community (SADC), Mozambique's main road transport network is expected to experience significant investment to meet demands of the commercial sector. However, despite this spike in general economic activity, Mozambique remains one of the poorest countries in the world, with 54% of the population living below the poverty line. Life expectancy is pegged at 52 years (World Health Organization, 2012) with per capita annual spending on healthcare at \$35, placing it near the bottom of WHO country rankings. Mozambique thus provides an ideal context in which to consider opportunities for public health systems to leverage private sector transport.

1.2 Aim of the Paper

This paper reviews current transport practices within the Ministry of Health (MISAU) and highlights existing trends in commercial transport with a view to presenting considerations in which the two sectors could collaborate to achieve improved reliability and increased efficiency in the distribution of medical commodities.

1.2.1 Objectives of the Paper

This paper seeks to:

- Examine current conditions of transport fleets and logistics practices managed by the Mozambique Ministry of Health (MISAU)
- Evaluate the health system's transport ability to fulfil its goals considering the unique business environment and practices of private transport operators in Mozambique
- Propose conditions under which private sector transporters could support MISAU's freight transport and distribution requirements, and
- Explore options to out-source transport in the health sector.

1.2.2 Scope of the Paper

The paper is prepared with specific consideration to the requirements of vaccine distribution in Mozambique. In Mozambique, the *Programa Alargado de Vacinação – Expanded Program on Immunization* (PAV) has responsibility for the management of the vaccine supply chain. However in practical terms, the institution does not possess complete control of the distribution of vaccines from the provincial level to the district and eventually to the healthcare centre, because it relies on common shared transport assets of each province to provide some logistical support. So, in addition to unpacking the vaccine supply chain, this paper also briefly considers the health system supply chain of essential medicines, pharmaceuticals and other commodities. While this research covers a review of the circumstances of MISAU's transport demand and current operation, it does not include a comprehensive, quantitative assessment of transport capacity and challenges, which requires more extensive surveys of multiple districts and access to financial data and detailed information on operations that was not available for this assessment.

2. STUDY APPROACH

2.1 Study Methodology

The study employed a mixed method approach to collecting and collating information. In order to understand the specific influences on transport performance in the health system and prevailing circumstances of the private sector, a field study was conducted in Mozambique by VillageReach staff during October/November 2013 and January/February 2014 (just before the onset and during the rainy season). A series of key informant interviews was conducted with parties responsible for the management of health service delivery, as well as with private sector parties engaged in freight transport, distribution and logistics services (refer to Table 1).

Table 1: Organizations interviewed

Supply Chain Layer	Interviewed Organizations
National	National Roads Administration (ANE); Association of Road Freight Transport Companies (ASTROCAMA); Central Drugs & Medical Supplies Procurement Service; Mozambique Central Medical Store Administration (Central de Medicamentos e Artigos Medicos) CMAM; Medical Supplies Importer (MEDIMOC); Ministry of Health; Expanded Program on Immunization (PAV); Transport Department & Third Party Logistics Providers (3PLs)
Province	Gaza, Maputo Direcção Provincial de Saúde/Provincial; Department of Health (DPS); PAV; Gaza, Maputo DPS Transport Departments; Ministry of Transport & Communications & Regional Third Party Logistics Providers
District	Ministry of Health; Rural Hospital Leadership; Administration & Finance & Local Third Party Logistics Providers
MISAU Partner Organizations	Clinton Health Access Initiative (CHAI); Danish International Development Agency (Danida); John Snow Inc.; UK Department for International Development (DFID) & United States Agency for International Development (USAID)

The fieldwork employed the following organising research questions to solicit relevant information from the stakeholders:

- What are MISAU’s existing resources and procedures to manage the distribution of medical commodities in the country?
- What are baseline performance expectations/requirements for this freight transport and distribution system?
- What key performance and resource gaps exist between current and desired performance?, and
- What opportunities are there to engage carriers and 3PLs to support MISAU’s distribution needs?

In order to provide more intimate comparisons and contrasts at the provincial and district levels, two relatively contrasting provinces, namely, Gaza and Maputo were selected for the fieldwork. These provinces were selected because of their differences in population density, travel distances, and general commercial activity that serve as variable inputs in evaluating the performances of the health system and commercial transport in each province. While both provinces have populations approaching 1.5 million, Gaza has considerably lower population density, with an area (75,709 sq. km.) – a massive 300% differential to the Maputo Province (22,693 sq. km.). Together, the provinces provide critical road transportation links to South Africa via the Maputo Corridor and west to Zimbabwe.

2.1 Triangulation of Information Sources

Because of the tiered approach to distribution of medical commodities by MISAU – whereby separate administrations within the ministry (national, provincial and district) are responsible for facilities and fleet management – interviews were conducted at each of these layers to provide as comprehensive a view as possible of key transport challenges faced by the flow of commodities throughout the supply chain. Additional interviews were conducted with transport services and roads management-related government administrations and associations to gain an understanding of the current status of road transport in the country. VillageReach also had discussions with bilateral aid organisations based in Mozambique.

3. LITERATURE REVIEW

Literature review confirms that since the 1990s, transport and communication, including freight logistics has slowly been creeping back into mainstream development agenda (World Bank, 2010; Transaid, 2012; Dias, 2013). Transport is thus viewed as an important building block of a sustainable and integrated production and distribution in Mozambique. In the same breadth, the transport sector is very much linked to and influences developments in other sectors of the economy. It affects the attainment of all eight Millennium Development Goals, and will indeed be central to the mooted Sustainable Development Goals. However, transport services in Africa are associated with high costs, attributable to a complex set of factors, including inadequate and poor infrastructure, aging and inefficient fleets, poor transport facilitation as well as limited competition and low traffic on some routes (Gannon et al., 2001; VillageReach, 2009; Chakwizira & Mashiri, 2012; Avis, 2014). Many of the rural transport and logistics challenges and issues have to do with the following factors (Mashiri et al, 2003):

- Relatively low densities and economies of scale
- The large distances that have to be traversed, mostly involving the use of poor roads or tracks;
- Low rates of private vehicular mobility and tele-connectivity, and
- Under-developed market facilities, storage and other logistical infrastructure.

Consequently efforts aimed at reducing the cost and improving the quality of logistics and rural transport systems also serve to improve healthcare service delivery and outcomes.

4. STUDY FINDINGS AND DISCUSSION

4.1 Road transport system in Mozambique

Understanding the road transport network is fundamental to a discussion that seeks to assess and proffer solutions towards enhanced health freight logistics. Mozambique's roadways extend 35,000km, of which an estimated 23,668km is classified. Approximately 80% of roads in Mozambique are unpaved, with this percentage at nearly 100% at the district level in rural areas (refer to Table 2). The condition of roads (some of which lead to healthcare facilities) in the districts can be hazardous and in some cases passage is not possible during the rainy season.

Table 2: Mozambique roadway development

Length of total roadway network	35,000 km
Total length of new construction and maintenance of classified roadways	23,668 km
Increase in construction of passable district roads	2,689 km
Roads (primary, secondary, tertiary, country) categorized in good/ acceptable condition	72%
Rural population living within 2 km. of a tertiary road	32.7%
Rural population living within 2 km. of a country road	80%
Share of funding of ANE: government-donations-international loans	52%-18%-30%

Source: ANE National Report 2012

To support road construction and maintenance, Mozambique relies on levies on fuel, road taxes and tolls, plus separate, non-transport tax revenues. It is also a recipient of significant bilateral and multilateral aid in support of infrastructure development including roadways. However, since 2010, the construction of new public and private roadways has increased as a result of the growing presence of extractive industries operating in Cabo Delgado, Niassa and Tete provinces

While the rate of increase in the size and quality of the nation's road network is improving, demand for better road conditions far exceeds the country's current capacity to respond and there continues to be a significant backlog of maintenance and construction of new transport infrastructure.

4.2 Road Transport Performance and Resource Gaps: The Realities

Because road transport is the most cost-effective means to convey goods, people and information to the greater majority of rural communities across sub-Saharan Africa, it is critical to the health and well-being of these communities.

The Mozambique National Roads Administration (ANE) is charged with improving and increasing road access for all communities throughout the country. Based on its most recent annual report, ANE has documented insufficient funding to complete its annual objectives for road development and improvement and hence the ever-increasing backlogs which have severe impacts on healthcare delivery.

“ Experience working in the country has taught us about the unique and harsh road operating conditions to which transport vehicles (including health vehicle) are used and exposed. The vehicles operating in rural areas face rough terrain, poorly maintained gravel and sometimes unformed gravel roads. Informal reports from independent assessments of the private sector in Mozambique's regions suggest that higher transport costs obtain outside major cities due to rough terrain and seasonal weather that result in greater wear and tear on vehicles and higher incidence of accidents ”
(Extract of an Interview with a District Health Official, Gaza, 18 November, 2013)

The silver lining in this is that Mozambique's transport sector is a growing industry. Freight transport companies operating at the national and provincial levels are responding to the growing demand by the oil and gas sectors to move goods and equipment north to their facilities. The country's largest transport ventures cover routes across all of Mozambique, although they typically limit their services to the district and national level – and so do not serve the more remote rural routes where some health facilities are located.

4.3 MISAU's Distribution Systems

4.3.1 Governance system

Medicines, health products and other commodities provided by MISAU are distributed throughout the country according to the prevailing administrative divisions of the country starting from national, to province and filtering through to the district level. The majority of commodities enter the country via the two main ports at Beira and Maputo, facilitated by as many as 40 private importers. Beyond the public sector, the importers also serve a growing number of private hospitals and pharmacies. Within the ministry of health, *Central de Medicamentos e Artigos Medicos* (Central Drugs and Medical Supplies Procurement Service – [CMAM]) is responsible for the purchase and supply of essential medicines and related medical supplies. The *Centro de Abastecimento* (CA) administration is responsible for the supply chain for health equipment (e.g. syringes, diagnostic equipment, hospital beds, etc.) and utilizes primarily the same supply chain assets (storage and transport) as CMAM. The vaccine supply chain operates separately from that for pharmaceuticals and equipment, and is administered under PAV. PAV manages its supply chain in largely the same tiered approach as CMAM and CA, with some vaccine storage facilities collocated with CMAM facilities at the provincial level. However at the district level vaccines typically are stored at separate locations owing to unique refrigeration requirements and the separate distribution system.

1.3.2. Rural Health Centres

Mozambique has built a network of approximately 1,400¹ rural health centres across the country to support its largely rural population. A significant majority of these facilities are off-grid and dependent on alternate fuel supplies – largely liquid propane gas (LPG) and solar – to meet their energy requirements. These facilities are typically modest buildings with limited storage capacity. Health workers stationed at the facilities are often overburdened in terms of providing care, which limits time dedicated to tracking inventories to ensure effective stock management, as well as other duties. Distances from the provincial capital to district facilities, and from district storage facilities to the health centres, vary widely (refer to Table 3). In Gaza Province, where 134 rural health centres are an average of 47.5km from a district storage facility, more than 15% are located at distances greater than 75km from a district depot. Road conditions to health centres can be challenging and travel times always interminable. Because of flooding during the rainy season, the routes demand the use of vehicles with high clearance typically with 4x4-traction capability. Because of bad road conditions and long driving distances, some health centres are only accessible during dry season.

¹ The number of active rural health centers varies from year to year as facilities open and close due to personnel changes, logistics and environment challenges, and planning priorities. This paper uses a figure of 1,400.

Table 3: Travel distances in Gaza Province

District	Distance from Provincial Storage Facility (Xai Xai) to District Capital Storage Facilities (km)	Number of District Health Centers /	Average Distance from District Storage Facility to Health Center (km)
Bilene	60	19	26
Chibuto	74	14	90
Chicualacuala	454	10	94
Chigubo	286	6	95
Chokwe	121	21	29
Guija	135	8	29
Mabalane	220	7	34
Manjacaze	59	20	35
Massangena	578	11	70
Massingir	248	3	36
Xai Xai	0	15	30

Source: Gaza DPS, 2013.

4.3.3. Vaccine Supply Chain

Mozambique's vaccine supply chain is defined in terms of its main distribution points: national, provincial, district, and health facility. Vaccines are stored at the National Vaccine Store and transported to provincial stores each quarter with quantities based on requisitions submitted by each province.

Mozambique coordinates the distribution of \$9 million of vaccines annually (PAV, 2013). Historically, PAV has freighted vaccines to the northern provinces, by air and to the southern provinces (Gaza, Inhambane, Maputo and Maputo City) by road transport. However, in 2013 PAV also used road transport to the north, primarily due to high costs and the limited capacity of air transport – placing significant strain on an already stretched freight logistics system. As is the practice for non-vaccines, provincial health authorities (DPS) assume responsibility for the capacity building, monitoring, supervision and technical support for vaccine logistics from the provincial depots to the districts. Distribution vehicles use cold boxes – no refrigerated vehicles are available for PAV use – to ensure temperatures are maintained to preserve the efficacy of the vaccines. However, PAV has insufficient vehicles of its own to support distributions to each facility, and rely on vehicles assigned to the provinces (and operating in the districts).

The district-level administrations within MISAU are responsible for the provision of freight vehicles to deliver vaccines (and other commodities) to health centers. In practice, however, districts do not always have sufficient transport capacity to make distributions, which requires health workers to leave their health centers and travel to the district stores to collect vaccines and other supplies. The impact on distributions as a result of limited transport capacity at the district level is exacerbated by the lack of management control PAV has over vehicles used at the district level (VillageReach, 2013).

4.3.3. Pharmaceutical Supply Chain: Procurement and Import

Mozambique National Medical Supplies Importer (MEDIMOC): Responsibility for the import of medicines into Mozambique was held by MEDIMOC as a monopoly owned by the state until 2007, when the market was privatized. After privatization, MEDIMOC became a semi-private importer (a portion of its ownership is still held by the government of Mozambique) that today competes with as many as 40 other registered importers to serve both the public health system and an estimated 150 private pharmacies, most of which are in Maputo City.

Currently, most importers do not possess significant facilities for storage or fleets for freight transport and distribution. Consequently, commodities are moved directly to customers' storage facilities. MEDIMOC previously possessed large storage facilities and a fleet of logistics vehicles to distribute to all 10 provinces. Today, the organization rents storage as needed and owns a single 4-ton transporter to supplement the capacity of its customers' transport fleets.

Central Medical Store Administration (CMAM): CMAM – *Central de Medicamentos e Artigos Medicos* is responsible for the procurement of essential medicines and pharmaceuticals for the government health system. CMAM issues tenders for importation and then assumes responsibility for coordinating internal country distribution, including the use of commercial transport companies through issued tenders. The administration stores commodities at three central medical store locations across the country, namely, Maputo City, Beira, and Nampula City. Commodities are trucked from these facilities to each of the ten provincial warehouses and to regional and city hospitals. From the provincial depots, commodities are transported to storage facilities in each of the 148 districts. Each district is responsible for distribution to its rural health facilities, which number from two or three to as many as several dozen per district. However, because of limited transport capacity in the districts, in practice, health centers themselves are often required to find transport to make collections from the districts.

4.3.4. Transport/Distribution Obligations

CMAM operates its own vehicles and uses commercial transport companies for distribution to the provinces' stores and to other major health facilities. For 2011, nearly 200 separate distributions were undertaken from the Beira and Maputo ports to provincial stores using commercial transporters. Travel distances ranged from 50km to over 2,300km, translating to hundreds of thousands of kilometres logged annually. In 2011, CMAM provided nearly \$1 million in outsourcing payments to 3PLs and carriers for distribution of commodities to the provinces (refer to Table 4).

Table 4: CMAM Transport Routes and Costs (2011)

Route Origin	Number of Trips	Value	
		MTM (000)	US\$
Beira	64	5,897	\$197,000
Maputo	135	23,838	\$795,000
Total	199	29,735	\$992,000

Source: Strategic Plan for Pharmaceutical Logistics (2012)

4.3.5. Logistics Resources – Vehicles and Staffing

While CMAM has a national staff of approximately 100, the majority of whom are based in Maputo, the number of personnel engaged in supporting the distribution of pharmaceuticals is effectively much greater, considering the role provincial DPS staff play in the management and storage of medical stocks. But despite the national importance of its function, and despite its primary logistics functional role, CMAM does not employ any logisticians (refer to Table 5). The gap between required and existing capacity is significant. In 2010, CMAM conducted an examination of needed resources and determined a minimum of 116 logisticians would be required to support its current scope and scale of activities².

Table 5: CMAM staff by level of education and training

Level/Areas	Total	Pharmacy	Admin.	IT	Accounting	Other
Higher Level	19	10	5	2	0	2
Mid-Level	32	6	18	1	4	3
Basic Level	1	0	1	0	0	0
Assistants/ Drivers	53	0	0	0	0	53
Total	105	16	24	3	4	58

Source: Strategic Plan for Pharmaceutical Logistics (2012)

CMAM's strategic plan for pharmaceutical logistics (*PELF*) plan cites the historical tendency to view the medicine supply function as primarily a role for pharmacists, not logisticians, and notes that there is no formal career path in logistics at the ministry. The chronic shortage of logistics professionals in MISAU is yet another stumbling block to effective healthcare delivery.

MISAU lists eight vehicles it operates that are dedicated to CMAM's distributions, namely, two 10-ton and six double-cabin pickups. CMAM also operates two mini buses managed by the transport department. Average age of CMAM's logistics vehicles is 6 years. CMAM's vehicles are part of a much larger fleet. MISAU operates 124 vehicles of which more than 20 are used for distributions by multiple MISAU programs. It is assumed CMAM has use of additional vehicles within this fleet on occasion. As noted above, CMAM employs commercial freight transport and distribution companies to support distribution to the provinces.

4.4 Ministry of Health Transport Capacity

The ministry of health oversees the use of government vehicles through dedicated fleet management functions at both the national and provincial levels. In the districts, where there is a lower percentage of functioning vehicles vs. official fleet capacity than at higher levels of the supply chain, there are few formal fleet management practices. This section provides a review of the practices and challenges faced by each layer of supply chain in managing its transport function.

² Strategic Plan for Pharmaceutical Logistics (PELF), 2012

4.4.1. National

In Maputo, MISAU operates a fleet of 124 vehicles to support distributions and administrative activities, and for ambulance service; approximately 20 of this total are used for freight transport and distribution only, although administrative vehicles may be used for distributions if there is need for additional capacity. The department was unable to indicate what share of the vehicles is currently operating, however it was estimated that 42% of the vehicles are seven years or older, 41% of the vehicles are between 4-6 years while 17% of the vehicles were aged between 0-3 years. Of the 20 distribution vehicles, five are one- to 10-ton freight vehicles (two of which are devoted to CMAM) and the remainder are double-cab, pick-up trucks with limited storage capacity. A variety of funding sources and/or MISAU administrative groups supply/utilize this fleet, including CMAM.

In terms of fleet management, MISAU's transport function head observed that the majority of the fleet was primarily suited to supporting freighting of equipment, not medicines. He also noted that the department had no refrigeration vehicles to transport vaccines. There are no PAV dedicated vehicles in the MISAU transport department fleet – which functions like a motor pool – use of the fleet is based on requisitions issued by groups within MISAU – suggesting there are minimal set schedules for distributions using the fleet. Maintenance of the fleet is undertaken by commercial vehicle mechanics. The transport department provides a quarterly report to the *Mozambique Administration and Finance Board (DAF)* concerning the use of vehicles in order to track expenditures against budget.

4.4.2. Province

Each province is responsible for the management of the fleet vehicles, covering insurance, maintenance, technical training, the purchase and the retirement (used vehicle sale or scrap scale) of vehicles. In its annual report for 2013³, Gaza DPS' transport department noted the following key constraints limiting effective management of its fleet:

- **Severe wear and tear on the fleet:** due to the poor conditions of rural access roads.
- **High incidence of accidents:** the 100-vehicle fleet experienced accidents at an average annual rate of 8% from 2008-2013. Nearly 50% of these are listed as serious, requiring extensive repairs and delays in return to service (refer to table 6).
- **Limited OPEX:** limited funding and slow payments to the districts for maintenance, repairs and insurance impacted the up-time of the vehicles for distributions.
- **Lack of appropriate vehicles:** insufficient supply of vehicles for specific uses (e.g. 4x4s to navigate rough rural terrain).
- **High maintenance and repair costs:** due to the lack of suitable mechanical repair services⁴.
- **Unannounced postponement of support resources:** e.g. funding, fuel, parts, etc. without prior communication to the transport sector.
- **Lack of spare parts:** due to funding shortages, and
- **Limited information systems:** to ensure active tracking and accountability for the proper use of vehicles.

³ Issued January 20, 2014

⁴ Gaza and at least some of the northern provinces with extensive rural geography have limited access to high-quality and cost-effective mechanical repair facilities in rural areas.

Table 6: Gaza, Maputo DPS Fleet Profile

Vehicles	Gaza Province			Maputo Province		
	7 years			10 years		
Average Age of Logistics Fleet	Total	Functioning	Est. OPEX (USD)	Total	Functioning	Est. OPEX (USD)
Logistics Vehicles Single-, Double-cabin Pick-ups (4x4s)	59	55	\$3,874,500	41	27	\$2,985,500
Ambulance	24	22	\$5,535,000	17	7	\$4,265,000
Mini Bus	4	4		7	3	
Administrative	19	15		12	5	

Source: Gaza, Maputo DPS (2013) – VillageReach estimates

To develop an estimate of the capital expended to purchase provincial transport fleets, a simple calculation was made using an estimate of the original purchase price of new vehicles, multiplied by the number of vehicles in each category. The CAPEX totals in Table 6 are based on the following price assumptions⁵:

- Logistics vehicles (single-, double-cabin: \$50,000 pick-up trucks)
- Ambulances: \$65,000
- Minibus: \$90,000
- Administrative: \$40,000

The estimates provide a range, from 70% - 100% of the calculations, in order to factor in price inflation. No estimate is made of the *current* value of each provincial fleet based on average depreciation values because of the difficulty in estimating the actual functioning condition of the vehicles. A large number of vehicles at provincial and district facilities were observed to be dysfunctional with a significant number only holding scrap value.

4.4.3. District

The operation of transport at the district level differs fundamentally from transport at the national and provincial levels.

Firstly, significantly fewer vehicles were in operation compared with the official provincial fleet capacity. Districts interviewed cited severe shortages of operational transport vehicles, and even worse numbers for operational logistics vehicles at levels as low as 10-15% of official fleet capacity cited by the provincial fleet managers. Table 7 cites data collected from districts in Gaza and Maputo provinces. In two of the districts only one vehicle is currently functioning to support distributions, for 14 (Maputo) and 21 (Gaza) health centers, respectively.

Secondly, operation of transport at the district level shows that vehicles are a shared resource as compared to province and national set-up. This may be due to the limited number of vehicles available, and the generally limited budgets provided at the district level.

⁵ Logistics vehicle costs are based on VillageReach's purchases for similar vehicles

Consequently, there is little logistics planning at the district level. Vehicle use is typically based on immediate demand rather than as a result of scheduled planning⁶.

Thirdly, at the district level few personnel are devoted to logistics. This lack of qualified logistics personnel was identified at other spheres of government – refer to Table 7.) *Monitoring* and management of vehicles was observed to be the responsibility of DPS district administration and finance personnel, but this function did not include proactive logistics planning.

Table 7: Gaza, Maputo District Fleet Profile

District / Province	Matola City: Maputo	Chokwe: Gaza	Chicumbane: Gaza
Population	830,000 (includes Matola City)	200,000	240,000
Number of Health Centers	14	21	14
Avg. distance to health center (km.)	No data	29 km	30 km (est.)
Fleet	9 logistics; 3 ambulances & 1 administrative	10 logistics; 5 ambulances	No data
Functioning vehicles	2 logistics; 1 ambulance & 1 administrative	1 logistics & 2 ambulances	1 logistics & 2 ambulances
Year of most recently allocated vehicles	No data	6 years	4 years

Source: Village Reach interviews (2014)

Districts appeared to regard ambulances as a priority, and as such, ambulances tended to receive more regular maintenance and equipment updates than distribution vehicles. As a result ambulances are often the only vehicles available for use in any capacity.

4.5 Overview of MISAU's Transport Function Performance

The study confirmed that MISAU's transport function is severely limited in capacity and performance due to intertwined reasons enumerated in Table 8. Key among these is the degree of fleet capacity shortage, particularly at the district level. While official provincial fleet lists include all vehicles owned by the DPS, the lists do not accurately reflect the number of vehicles that are functional and available for use. The gap between official tallies and the number of vehicles that are functional was found to be very high with some districts visited, not surprisingly recording only 20% of vehicles as operational. With such significant difference, it was observed that:

- Ad hoc distributions has become the norm: Fleets with limited capacity essentially operate continually in *emergency mode*, conducting urgent deliveries, and

⁶ VillageReach's 2013 District Logistics Capacity Study noted that "...the districts often rely on a mix of transportation methods or a combination of vehicles to collect medicines/vaccines & carry the distributions out, since the districts' access to closed vehicles varies so much from month to month..."

- Ambulances become the default logistics vehicles for some districts. As a result districts place a higher premium on a functioning ambulance than a logistics vehicle.

Table 8: Primary contributors to underperformance of the DPS transport function

Contributing Factors	Impact Description
Chronic transport capacity shortage in districts	<ul style="list-style-type: none"> • No proactive, comprehensive logistics planning • Ad hoc distributions are standard • High unit cost of delivery • Ambulances used for distributions
Insufficient CAPEX to purchase new vehicles	<ul style="list-style-type: none"> • Replacement rate less than 50% of vehicle expiry rate • Severely aged fleets • High per-vehicle maintenance costs due to over use
Delays in payment for budgeted & approved expenditures	<ul style="list-style-type: none"> • Insufficient funds for fleet operations, covering fuel, driver per diems, maintenance/repairs, insurance, etc.
Disconnected financial management practices	<ul style="list-style-type: none"> • District expenditures not tracked at the provincial level • Reliable transport OPEX not easily determined due to shared costs at district level
Weak underlying road & transport services infrastructure	<ul style="list-style-type: none"> • Requires highly rugged (expensive) vehicles to navigate rural routes • Maintenance/repair services not easily accessible, especially for provinces with large rural communities
Shortage of logistics personnel	<ul style="list-style-type: none"> • Efficiency, optimization planning not practiced

It is thus evident that districts found it all but impossible to conduct comprehensive logistics planning because of these limitations. It was also observed that excessive use of the few vehicles available was also likely to increase cost per delivery, due to higher wear and tear on the vehicles.

The fluid and predictable release of funds is a critical component for asset-based enterprises in order to ensure the assets retain their value of service for their projected lifespan. Fleet managers at the national, provincial and district levels all cited periodic and, in some cases, severe delays in the release of funds for regular repairs and equipment replacement, as well as for fuel, driver per diems, insurance and other typical operating expenses. Fleet managers submitted requests to Acquisitions Execution Management Unit (UGEA) to review and then forward to DAF for funding. This paper-based process becomes interminable if there are qualifying questions from UGEA or DAF about a request. One DPS fleet manager cited an example of a 3-month wait for the release of funds to purchase a set of tyres for a vehicle. Such lengthy delays especially in rural areas can result in effective reductions in the value of the assets during their lifespan.

It was also observed that severe limitations were placed on fleet managers and district administrators responsible for government vehicles because they were often unable to

source reliable financial data that would enable performance evaluations on their operations – which was exacerbated by inadequate skills and training to practice sound financial management. It was generally difficult, for example, to isolate specific transport costs within MISAU because of the high incidence of shared use of vehicles, lack of documentation (i.e. accurate trip logs) and because record keeping did not adequately categorize full and true costs for transport. This issue is fundamental to the consideration of outsourcing transport in the future – MISAU needs to benchmark current transport costs in order to determine what it is willing to pay in the future to gain improvements in capacity and efficiency.

4.6. Opportunities for engaging carriers and 3rd Party Logistics (3PLs) to support MISAU's distribution needs

4.6.1 Public-Private Partnerships

An important anticipated result of the dramatic growth of extractive industries is the positive impact this growth could have on the development of small and medium enterprises (SMEs). The African Development Bank (AfDB) estimates approximately 43% of the private sector workforce is employed by SMEs, with a turnover of nearly \$1billion. Transport is as yet still severely under-represented in the SME sector at only 1% of the businesses, and valued at \$39m, or 4% of total turnover. Both the AfDB and the Mozambique government see SME development as strategic to “promoting social inclusive growth.” Opportunities are opening up for more small-scale regional and district-based carriers and 3PLs to respond to the demand for freight transport, particularly given that larger freight vehicles (10ton+) are better suited to the main paved highways and regional routes – while district roads typically only support a maximum of 2-5 tons. It is instructive to note here that DPS primarily operates 1-1.5 ton 4x4s to serve communities and health centres accessible via country road networks. Overall, in addition to demands for improvement in road transport by key sectors such as mining and oil and gas, the commercial transport sector itself is seeking general improvements in market conditions and economics for freight transport and distribution.

4.6.2 Carriers and third-party logistics providers

The broad range of freight transport and distribution companies operating in Mozambique covers two separate profiles – carriers offering simple hire of their vehicles (including driver) for customers to transport their freight from point A to point B, and 3PLs that offer integrated services to plan and make more efficient the storage and transport of commodities. As with 3PLs in other countries, scale is an important variable for success, in order to achieve economies of scale and competitive (low) unit costs of transport.

4.6.3 Characteristics of Freight Companies in Mozambique

While there are many differences between 3PLs operating at national and provincial, and typically less sophisticated carriers servicing district levels, the following are observed circumstances for transport companies that operate at various levels:

- *High costs of entry to achieve large-scale business growth:* Mozambique applies an average import duty of 9% for vehicles (SADC, 2012). However duties vary widely depending on the class of vehicle⁷. Because of these inflated prices, and owing to growing demand for vehicles and other equipment, there is a sizeable used-vehicle market: cars, trucks and heavy equipment are sourced from Japan and Korea,

⁷ VillageReach has experienced duty of nearly 30% of the total value of vehicles it has purchased for its work in Mozambique (all-terrain, 4x4s).

where, strict standards are in place for the regular maintenance and evaluation of vehicle performance.

- *Negotiated pricing – no standard load/distance charges:* All private sector organizations interviewed for this evaluation noted the road freight sector does not have consistent or standard pricing for load/distance, owing to regional differences in pricing and inflated demand for transport in the past three years. A survey of regional road freight data and incidental pricing mentioned during interviews suggests a broad range in pricing: from \$.10 –\$1.50+/tonne/km. More precise estimates of prevailing market pricing could be determined by conducting more extensive interviews with a larger pool of 3PLs.
- *High variable operating costs:* Transporters interviewed noted high operating costs for their businesses. Independent data suggests variable costs (fuel, tyres, maintenance, etc.) are inflated in Africa – reaching levels close to European freight companies. These high costs are attributed to typically low vehicle capacity, the extended use of (older model) vehicles, poor maintenance practices, and poor road conditions⁸ (AICD, 2008). This implies that businesses with older fleets and those operating in rural areas with rougher road conditions will have higher cost structures than businesses operating on routes with primarily higher quality surfaces using new fleets.
- *Self-maintenance:* All companies interviewed for this study conduct their own maintenance, other than for highly technical work. Two of the companies interviewed began business as mechanical repair service companies, and each concluded that they could retain a competitive advantage for their freight business by maintaining their own vehicles. Both owners noted that demand for quality mechanic service is far greater than current supply. Both businesses eventually stopped providing repair services as their transport and distribution grew to become the dominant elements of their businesses. Mozambique has a reputation for poor-quality auto mechanic standards – and stories abound in the marketplace of unsuspecting owners having new equipment in their vehicles switched out for old by unscrupulous mechanics. There are no vocational training programs for young aspiring mechanics; the only avenue is to join an existing business and learn on the job, and
- *High driver turnover:* Companies interviewed cited personnel quality as the greatest risk to their business. Attracting and retaining reliable drivers and mechanics requires business owners to keep very close to the day-to-day operations, making it difficult to manage strategically and expand to scale. One company cited an average retention rate of 10-20% for drivers after 3 months largely because employees continually seek new opportunities as a result of the boom in the sector.

4.6.4 Classes of Freight Companies

Table 9 profiles road freight companies operating at the national, provincial and district levels, based on interviews with the private sector conducted during the research period. A clear difference in the scope and scale of businesses according to their primary level of operation was observed, for example, district freight operators tend to derive most of their business from agriculture and construction sectors, and engage with customers for largely single-trip transport. On the other hand, larger national operators provide service to a much broader range of commercial sectors requiring longer-term service agreements, and in turn,

⁸ Variable costs represent the bulk of total transport costs in Central and West Africa, with a minimum average ratio of 70/30 for variable/fixed costs; the main components of variable costs are fuel and tires (AICD, 2008)

may have the opportunity to differentiate their service offering to include the provision of non-freight carrying vehicles (e.g. large equipment rental) rendering them more viable.

Table 9: 3PL carrier profiles at national, provincial and district levels

Level of Operation	Operating Environment & Markets	Scale (No. of vehicles & freight capacity)	Services	Success Factors
National	National/regional <ul style="list-style-type: none"> • Import/export • Services • Mining, oil/gas • Agriculture • Construction • Industry/manuf 	200+ Fleet (5 – 40 ton)	<ul style="list-style-type: none"> • Transport & distribution • Freight & heavy equipment • Mechanical repair 	<ul style="list-style-type: none"> • Multiple facilities (commodities & vehicle storage, maintenance) • Differentiated services • Servicing multiple sectors
Regional / Provincial	National/regional/ district <ul style="list-style-type: none"> • Services • Agriculture • Construction • Industry/manuf. 	15 – 50 (1 – 40ton)	<ul style="list-style-type: none"> • Transport and distribution • Mechanical repair 	<ul style="list-style-type: none"> • Single or multiple facilities (typically vehicle storage, maintenance only) • Independent maintenance
District / Local	District/regional <ul style="list-style-type: none"> • Agriculture • Construction 	< 15 fleet (1 – 10ton)	<ul style="list-style-type: none"> • Transport only 	<ul style="list-style-type: none"> • Independent maintenance • Concentrated ownership (family)

Source: VillageReach interviews and estimates (2014)

5. CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Main Findings

The key findings emanating from this assessment include:

- The burgeoning growth of the transportation sector is linked to increasing demand from the emerging extractive industries that are expanding operations in northern Mozambique. East-West transit corridors linking Mozambique’s major ports to neighbouring countries are expected to expand significantly as regional trade increases.
- Current levels of CAPEX funding for MISAU national and provincial transport fleets are insufficient to replenish fleets with new vehicles in order to maintain an average vehicle age of 3-4 years.
- Delays in payments for approved and budgeted expenditures, has significant impact on the ability of transport managers to maintain and operate vehicle fleets.

- The established practice of district health system vehicle fleets owned and managed by the provinces limits the ability of the districts to allocate transport assets according to their priorities.
- In rural areas, poor road quality and limited transport service infrastructure (fuel depots and commercial mechanic/repair facilities) raise the cost for and limit the participation of commercial transport companies in many of the communities in which health centers are located, and
- The severe shortage of logistics personnel and the limited number of vehicles at the district level makes comprehensive logistics planning for DPS all but impossible, with districts defaulting to ad hoc distributions.

5.2 Recommendations

The recommendations listed in Table 10 below, which cover three inter-related metrics underlining the need for integrated and inclusive solutions, primarily tackle long-term strategic priorities MISAU needs to address as it seeks to improve the overall quality and capacity of its transport function, with a view to engaging, and perhaps inviting on board external transport service providers on a larger scale.

Table 10: Summary of study recommendations

Intervention Tool	Brief Description
Strategic Measures & Policy Actions	<i>Audit fleet capacity within DPS fleets:</i> The assessment revealed a significant discrepancy between the official fleet manifests of the provinces & functional vehicles available in the districts. Independent district logistics audits would certainly reveal the true current transport capacity, and also expose prevailing vehicle usage practices, indicating periods vehicles have been non-functional. Such district audits would support long-term planning goals for MISAU as well as detail critical gaps in transport that must be addressed urgently.
	<i>Benchmark vehicle use:</i> Currently, fleet managers at the provincial & national level are unable to fully document the use of their vehicles. As a result there is incomplete data on fuel consumption, distance & destination logs, and maintenance, damage & repair histories for vehicles. To consider outsourcing the transport function to the private sector & evaluating its competitive benefits, a more accurate benchmarking is necessary of the current use of vehicles, the attendant costs & overall performance.
	<i>Determine the efficacy of 3PLs & carriers to distribute MISAU commodities:</i> MISAU needs to establish base-minimum performance levels & monitoring practices to develop data in support of ongoing evaluations & set incentives to discourage poor performance (e.g. withhold payment) by private carriers.
	<i>Evaluate private sector transport capacity:</i> Given the broad differences in the capacity, performance & technical quality of private sector transporters across Mozambique, it will be crucial to understand the practical benefit of engaging with the private sector as a precursor to determining ideal partners for MISAU.

	Thus, audits of 3PLs in the unique geographies proposed for outsourcing need to be conducted to ensure an accurate assessment.
Operational Efficiency	<i>Institute key performance indicators (KPIs) for optimal fleet operation:</i> Transportation management at the national & provincial levels of the health system are challenged in developing optimal, efficient fleet operation due to general shortages of vehicles. As a result, management activities are primarily limited to administrative tasks (e.g. issuing requisitions for repairs & equipment & responding to unique requests for use of vehicles). The establishment of core KPIs & a regular (monthly, quarterly) dashboard report would enable proactive logistics planning & support goal setting & achieving performance improvement over time.
	<i>Manage district fleet assets independently:</i> District health managers are accountable for distribution of vaccines & other commodities, but do not have responsibility for the transport assets used for distributions. In particular, ownership of vehicles is held at the province, which limits appropriate asset management to reflect district priorities. MISAU is assessing options to further decentralize services through its five-year PESS strategic plan. However, providing districts with ownership & full decision-making responsibility of their vehicles would enable greater degrees of accountability & performance evaluation.
	<i>Streamline budgeting & financial approval processes:</i> The MISAU transport function operates with uncertainty due to the vagueness of budget management & funds availability. To enable greater accountability at lower levels of the health system supply chain, managers require greater funds management flexibility & more reliable (shorter) response times to requests for financing.
	<i>Establish private sector engagement practices to support outsourcing</i>
Human Resource Development & Management	<i>Establish logistics management positions & supporting training:</i> The severe shortage of professionally trained logistics managers for all levels of MISAU's supply chain, and the lack of job descriptions within CMAM for logistics managers strongly points to a need for MISAU to conceptualize these roles as critical for both direct management of an internal transport function & for outsourcing. The need to plan for and fund logisticians cannot be over-emphasized.

5.3 Concluding Remarks

MISAU is seemingly struggling under the weight of an overly tiered supply chain. It does not have the personnel, expertise and the funding to manage an asset-heavy transport function efficiently. In the context of this system then, many rural Mozambicans do not have access to even the most basic healthcare. MISAU recognizes the challenges it would face in continuing to support the current model – and the missed opportunity to broaden access to healthcare. In response, it is pursuing a path of decentralization and private sector engagement in order to capture and realize greater efficiencies and develop a more sustainable and equitable path for improvement.

Conversely, the private sector in Mozambique is experiencing one of the fastest rates of growth in Africa, with newly discovered natural resource reserves spurring demand for more employment in the north, and increases in infrastructure investment and development. Both of these factors will serve as catalysts to help develop the country's entrepreneurial class. Because of the expected increase in demand for improved access (to markets, public services and other transport links), a key sector that will gain further investment and develop entrepreneurs is transportation.

REFERENCES

AFRICAN CAPACITY BUILDING FOUNDATION. (2004). *Reconstruction & capacity building in post-conflict countries in Africa: A Summary of lessons of experience from Mozambique, Rwanda, Sierra Leone & Uganda*. Harare.

ARVIS, J. (2014). *Connecting to compete 2014: Trade logistics in the global economy*. The Logistics Performance Index & Its Indicators. The International Bank for Reconstruction & Development / World Bank.

CHAKWIZIRA, J., & Mashiri, M. (2012). *Rural transport & freight governance crossroads in South Africa*. Paper presented at South African Transport Conference, Johannesburg, 9-12 July 2012.

DANIDA (2012). *Mozambique health & nutrition sector programme support*.

DIAS, P. 2013. *Analysis of incentives & disincentives for tobacco in Mozambique*. Technical notes series, MAFAP, FAO. Rome.

DIAS P., 2012. *Analysis of incentives & disincentives for cotton in Mozambique*. Technical notes series, MAFAP, FAO, Rome.

DOMINGUEZ-TORRES, C., & Briceño-Garmendia, C. (2011). *Mozambique's Infrastructure: A continental perspective*. Africa's Infrastructure | A Time for Transformation. The International Bank for Reconstruction & Development / World Bank. Washington, DC.

ECONOMIC COMMISSION FOR AFRICA, (2009). *Africa review report on transport: A summary*. Sixth Session of the Committee on Food Security & Sustainable Development Regional Implementation Meeting for the Eighteenth Session of the Conference on

Sustainable Development, Addis Ababa, 27-30 October, United Nations Economic & Social Council.

FOSTER, V., Briceño-Garmendia, C. (2010). *Africa's infrastructure: A time for transformation*. International Bank for Reconstruction & Development / World Bank. Washington. (DOI: 10.1596/978-0-8213-8041-3).

GANNON, C., Gwilliam, K. Liu, Z. & Malmberg-Calvo, C. (2001). *Transport: Infrastructure & services*.

KANE, M. (2008). *Evaluation of the project to support PAV (Expanded Program on Immunization) in Northern Mozambique, 2001-2008*.

MEEUWS, R. (2004). *Mozambique – Trade & transport facilitation audit*. World Bank. Rijswijk. (R20040164/30144/rme/lwi).

MASHIRI, M. Naude, A. & Nchabeleng, A. (2003) *Rural transport strategy for South Africa*, CSIR Report for the Department of Transport, Pretoria

MASHIRI, M. et al (2007). *Unpacking the relationship between rural healthcare, mobility & access*. PG Report: Rural Accessibility and Development. Pretoria. (CSIR/BE/RIS/IR/2007/0101/B).

NAUDE, A., & Khumalo, S. (2001). *Establishment of viable rural supply chains, markets & associated economic opportunities*. Paper presented at South African Transport Conference, Johannesburg, 16-20 July.

NATIONAL ROAD ADMINISTRATION. (2012). *Integrated Road Sector Program*. 2012 Annual Report.

PILZ, K., J. R. Durao. (2012). *Strategic Plan for Pharmaceuticals*. National Directorate of Medical Assistance, Ministry of Health. Maputo.

PRICEWATERHOUSECOOPERS. (2013). *Future prospects in Africa for the transportation & logistics industry*. Africa Gearing Up. (pp. 55-60)

RIBEIRO, J. et al. (2011). *Republic of Mozambique: Country Strategy Paper 2011-2015*. African Development Bank Group.

SOUTHERN AFRICAN DEVELOPMENT COMMUNITY. (2012). *Transport Sector Plan*. Regional Infrastructure Development Master Plan

SOUTHERN AFRICAN DEVELOPMENT COMMUNITY. 2012. *"Towards a Common Future"* Southern African Development Community. 2012. Web. 5 April 2014.

TERAVANINTHORN, S., & Raballand. G. (2009). *Transport prices & costs in Africa: A review of the main international corridors*. World Bank, Washington, DC

TRANSAID. (2012). *Support to the transport sector, Provincial Directorate of Health, Tete Province*. (104.Moz.810-400-2-2.a.MPM).

U.S. CHAMBER OF COMMERCE. (2013). *Investment climate update: Mozambique*. Africa Business Initiative.

USAID|DELIVER. (2010). *Emerging trends in supply chain management: Outsourcing public health logistics in developing countries*.

VILLAGEREACH (2009) *Comparison of costs incurred in dedicated & diffused vaccine logistics systems: Cost-effectiveness of Vaccine Logistics in Cabo Delgado & Niassa Provinces, Mozambique* (2009)

VILLAGEREACH (2009). *Comparison of costs incurred in dedicated & diffused Vaccine Logistics Systems*. Seattle.

VILLAGEREACH. (2012). *Logistics Systems and Management Assessment in Sofala, Manica and Tete Provinces*. Seattle.

VILLAGEREACH. (2013). *District Logistics Capacity Study: Examining the capacity of 53 districts in Mozambique to carry out health logistics & supply chain Activities*. Seattle.

WORLD BANK. (2010). *Prospects for growth poles in Mozambique*. Finance & Private Sector Development, Africa Region.