

Report on Strengthening the Warehouse Management System for the Pharmacie Populaire du Mali

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About SIAPS

The goal of the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program is to ensure the availability of quality pharmaceutical products and effective pharmaceutical services to achieve desired health outcomes. Toward this end, the SIAPS result areas include improving governance, building capacity for pharmaceutical management and services, addressing information needed for decision-making in the pharmaceutical sector, strengthening financing strategies and mechanisms to improve access to medicines, and increasing quality pharmaceutical services.

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ACRONYMS

AIDS	acquired immunodeficiency syndrome
ANTIM	Agence Nationale de Telesante et d'Informatique Medicale
CMS	central medical store
ERP	enterprise resource planning
HIV	human immunodeficiency virus
HR	human resources
IHS	Imperial Health Sciences
IT	information technology
KPI	key performance indicator
LMIS	logistic management information system
MNCH	maternal, neonatal, and child health
MoH	Ministry of Health
PPM	Pharmacie Populaire du Mali
SIAPS	Systems for Improved Access to Pharmaceuticals and Services
SOP	standard operating procedure
STTA	short-term technical assistance
TA	technical assistance
USAID	US Agency for International Development
VEN	vital, essential, nonessential
WMS	warehouse management system

EXECUTIVE SUMMARY

Mali's national pharmaceutical policy, (PPN), aims to guarantee that the population has fair access to quality essential medication and promotes its rational use. Pharmacie Populaire du Mali (PPM) is a strategic health commodities supply chain entity that aims to offer public health facilities and programs the best possible service level for product availability and quality service. PPM strives to offer the best possible supply chain services to its clients, but it has experienced a number of challenges, such as low service levels for essential health commodities, inadequate funding, and inadequate human resources (HR) in terms of both numbers and skills.

The SIAPS Program, mandated by USAID, has provided technical assistance to reinforce Mali's pharmaceutical system. In August 2015, SIAPS, in collaboration with Imperial Health Sciences (IHS), visited the PPM central warehouse in Bamako to develop a roadmap for improving PPM's warehouse management. To accomplish this, SIAPS conducted an in-depth analysis of the current PPM situation and identified the issues to be addressed, with a focus on the entire PPM supply chain system and management information system (MIS).

The situational analysis of PPM, which was conducted with an information-gathering tool developed by SIAPS, showed that the reporting capabilities of the MIS to support planning and modeling activities are still limited. Unfortunately, the PPM central warehouse does not conform to good storage minimum requirements, and the current system limits the efficient organization of stock and staff movement, prevents the implementation of efficient processes, and hinders the implementation of standard operating procedures (SOPs). Commodities arrive randomly, i.e., without proper supply/delivery schedules coordinated between PPM and the supplier. The receipt process is not fully automated, and products are counted manually. Therefore, the Warehouse, Finance and Accounting, and Information Technology (IT) Departments' stock data are not linked.

Based on these gap analysis findings, the available options, and their advantages and limitations, SIAPS made recommendations to ensure that PPM would opt for the most practical, modern, and feasible systems, particularly for business processes, transaction reporting, inventory management, and HR capacity-building opportunities. Although implementing a warehouse management system (WMS) will not in itself reduce inventory levels, if it is properly implemented, it can help organize the processes within the storage facility and provide greater visibility of stock status.

As PPM's operations increase, the warehousing requirements will also increase, and a much more sophisticated and modern system will be necessary. To serve beyond the current needs, it is advised that PPM procure a new commercial WMS that can be sourced with the required specifications for PPM, including the availability of in-country technical support and the ability to link with other PPM information systems and perform day-to-day warehouse management transactions.

At an April 14, 2016, meeting of PPM and SIAPS, Sage 100 Enterprise i7 was identified as the best integral solution for the PPM WMS. This up-to-date system can link accounting functions

with warehousing and stock management operations and provides a reliable and visible account of all its operations and activities to the Ministry of Health (MoH) and its partners.

For the successful implementation of the new WMS, a change management strategy is recommended to support staff in handling the transition to this new system.

INTRODUCTION AND PURPOSE

PPM is a strategic health commodities supply chain entity for the government of Mali. It operates under a performance contract with the government that is renewable every three years. The performance contract expects PPM to offer public health facilities and programs the best possible service level in terms of product availability and quality service.

Since its inception, PPM has strived to offer the best possible supply chain services, particularly procurement and distribution of health commodities, to its clients. However, while providing services, PPM has experienced a number of challenges, such as a low service level for essential health commodities, inadequate funding, and inadequate HR capacity in terms of both numbers and skills.

In addition, PPM has a weak information systems that is struggling to capture, document, and provide real-time reports on the status of commodities and issues related to the management and coordination of stakeholders' and specific programs' commodities for such conditions as human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS); malaria; tuberculosis; and maternal, neonatal, and child health (MNCH).

With an understanding of the challenges and in response to various assessments, reviews, and recommendations from stakeholders, PPM asked for technical assistance from the USAID-funded SIAPS Program to guide the best strategies to improve and strengthen PPM's supply chain and SOPs. In response, SIAPS conducted an in-depth analysis of the current PPM operations and identified issues to be addressed, with a focus on the entire PPM supply chain system rather than just one or two areas of intervention. Among the areas assessed was the PPM MIS.

A rapid situational analysis of PPM identified three MISs that were in use:

- paper-based tools, such as stock cards, ledgers, and registers
- Microsoft Excel files, specifically for HIV commodities
- LogiPPM, a warehouse management software program that was built in-house and is maintained by an external consultant

LogiPPM supports the current logistics operation, including receiving; preparation of picking lists, packing lists, and delivery notes; and order processing. Although it meets the current needs, the reporting capabilities of LogiPPM to support planning and modeling activities are limited.

Warehouse Management Systems

A WMS is a data-driven software program that is used to manage the flow of materials into, through, and out of storage facilities by processing the transactions associated with each movement, from receiving and put-away to picking, packing, and shipping. WMS software relies

on information systems and tools, such as computers, barcode scanners, radio frequency, and forms.

These systems can operate independently or serve as modules that connect with or are part of an enterprise resource planning (ERP) system. These planning systems support warehouse workers through standardized processes, instructions, rules, and parameters that are established during system implementation.

What Tasks Does a WMS Support?

A typical WMS can provide detailed directions for the receiving, storing, bin selecting, picking, and shipping tasks that are required in all warehousing operations. Using preset inventory thresholds, the system can also trigger reorders, and, with well-defined processes, a WMS can be used as a monitoring tool. Within an ERP system, a WMS can operate as a resource management tool by linking warehouse operations with financial/administrative functions. A WMS supports all information processes within a storage facility that aid with the flow of products, including:

- reception
- storage
- bin selection and replenishment
- picking/packing
- shipping
- reporting

Benefits of Implementing a WMS

Although a WMS will not in itself reduce inventory levels, if it is properly implemented, it can help organize the processes within the storage facility and provide greater visibility of stock status. Inventory levels will decrease with good data input and usage and with proper management of the system. Studies on WMS implementation have found that automating warehouse processes through a WMS may increase inventory accuracy by up to 20% on average and decrease the costs of carrying inventory by 27% on average.

Rationale for PPM to Strengthen its WMS

PPM will have to upgrade its current MIS to a system with more functionality. This could be either through a systematic upgrade of LogiPPM to enable all required functionalities or by purchasing advanced software that will integrate the procurement, finance, HR, warehouse operations, and client functions. However, in this strategic period, the recommended system should be simple and focused on warehouse management. It should respond to inventory management needs, such as ordering, stocking, sales order generation and fulfilment, stock location, stock update, alert for stock levels, and batch management.

Objectives

The specific objectives for improving the PPM WMS were:

- documenting an overview of the PPM WMS based on the current situation in receiving, storage, inventory management, order preparation, IT infrastructure, and HR capacity
- identifying existing gaps that need to be addressed for the implementation of a new WMS
- documenting options for PPM to improve the existing WMS
- organizing the processes within the PPM central medical store (CMS)
- providing greater visibility and traceability of stock

METHODOLOGY

In August 2015, SIAPS, in collaboration with IHS, visited the PPM central warehouse in Bamako to develop a roadmap to improve PPM warehouse management. Among the key activities that were identified was a gap assessment exercise that would highlight PPM's gaps in its readiness to implement a new WMS.

Developing the Approach to Guide PPM on Strengthening the WMS

A roadmap was developed to define the systematic approach that would be employed to support PPM in implementing a new WMS. This approach was designed to define the areas of focus for improving PPM's WMS; introduce the WMS gap analysis protocol, including developing a rapid assessment tool; and define the key steps to be taken if PPM opted to procure a new WMS.

The roadmap and information-gathering tool are included as annexes 1 and 2, respectively.

WMS Gap Analysis

The WMS gap analysis was performed with a tool developed by SIAPS to collect information and data. Key information that was collected included receipt and inspections, storage, inventory management, and master data infrastructure. Additional collected information focused on order preparation (pick/pack/dispatch), reverse logistics management, IT infrastructure, and HR capacity.

Information and Data Collection

Data were collected using a structured WMS gap assessment tool developed by SIAPS (annex 2) that focused on the following key areas:

- receipt and inspections
- storage
- inventory management and master data infrastructure
- order preparation (pick/pack/dispatch)
- reverse logistics management
- IT infrastructure
- HR capacity

The data collection was performed remotely. PPM staff responded to questions in the data collection tool, and further details, including flowcharts, were provided by the IHS consultant who provides technical assistance (TA) to PPM on warehouse operations and business processes. Validation of information was performed by SIAPS (Mali and headquarters staff) and the IHS consultant, and the information that was collected was validated by PPM staff and management.

Analysis and Reporting

An analysis was performed based on the validated information that was collected from the PPM warehouse, information, and quality assurance staff. A WMS gap analysis validation workshop was conducted in Mali on December 28, 2015, for PPM staff and key stakeholders.

Analyses and findings were used to make recommendations for improvement, particularly in the areas of business processes, transaction reporting, inventory management, and HR capacity-building opportunities.

Limitations

Due to time and resource limitations, the gap analysis focused on high-level details and was not a deep, detailed, data collection analysis. Information gathering was completed through remote data collection rather than with a site assessment method; however, much of the PPM warehouse information was already available to SIAPS due to the continuous TA it had provided since April 2014. The gap analysis focused only on the central warehouse and not on the regional PPM warehouses.

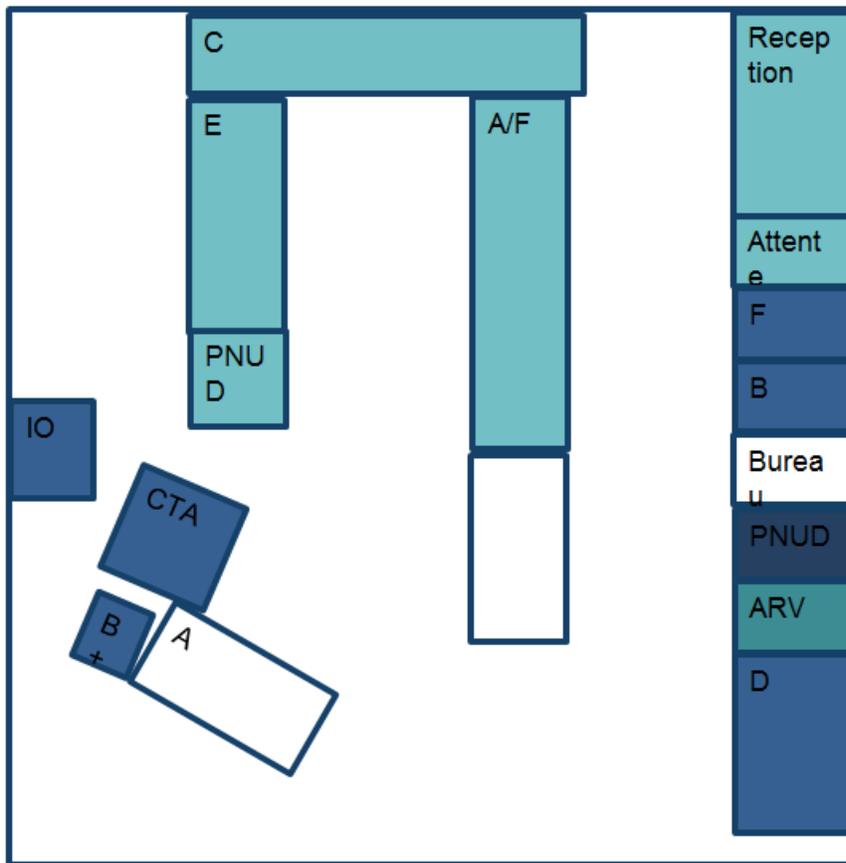
WMS GAP ANALYSIS FINDINGS

The WMS gap analysis findings are summarized below.

Findings

Overview

The PPM central warehouse comprises 10 small storage spaces. The layout of the storage facilities and locations makes it difficult for facilities to conform to the good storage minimum requirements that are recommended in WHO's storage guidance¹. Figure 1 illustrates the current PPM central warehouse layout².



The current layout limits the efficient organization of stock and staff movement, prevents the implementation of efficient processes, and hinders the implementation of SOPs.

¹ http://apps.who.int/prequal/info_general/documents/TRS908/WHO_TRS_908-Annex9.pdf

² Not drawn to scale

Additional general findings included the following:

- The PPM central warehouse in Bamako has approximately 20 warehouse employees plus daily contract workers. Seven of those 20 employees are storekeepers.
- The gap analysis identified several areas, including regular storage, cold storage, quarantine, and a staging area for the reception of new products. However, there is no area for controlled substances.
- The gap analysis also indicated is that other than cold storage, these areas are not clearly labeled. Codes for the different storage areas and locations have not been implemented throughout the 10 small storage spaces. Storage areas are not organized with shelves or racks, making it difficult to assign location codes.
- The 10 small storage areas are identified as A through K. Each warehouse is assigned a group of products, and those products are organized by therapeutic or pharmacologic categories.
- An additional rented warehouse in Bamako is modern, has a clear stock location system, and is capable of handling up to 800 pallets at a time.
- Written SOPs for inspection, order picking and packing, and reverse logistics and guidelines on good storage practices are not followed.

Receipt

In summary, commodities arrive randomly, i.e., without proper supply/delivery schedules coordinated between PPM and the supplier (particularly priority program commodities, such as malaria and HIV). The container is unloaded in the “reception” warehouse. The committee is invited to verify the goods. Once inspection is completed, commodities are allocated to stores, and records are entered into the database. Management is usually informed of all receipts on a regular basis. Figure 2 outlines the process of receiving products within PPM.

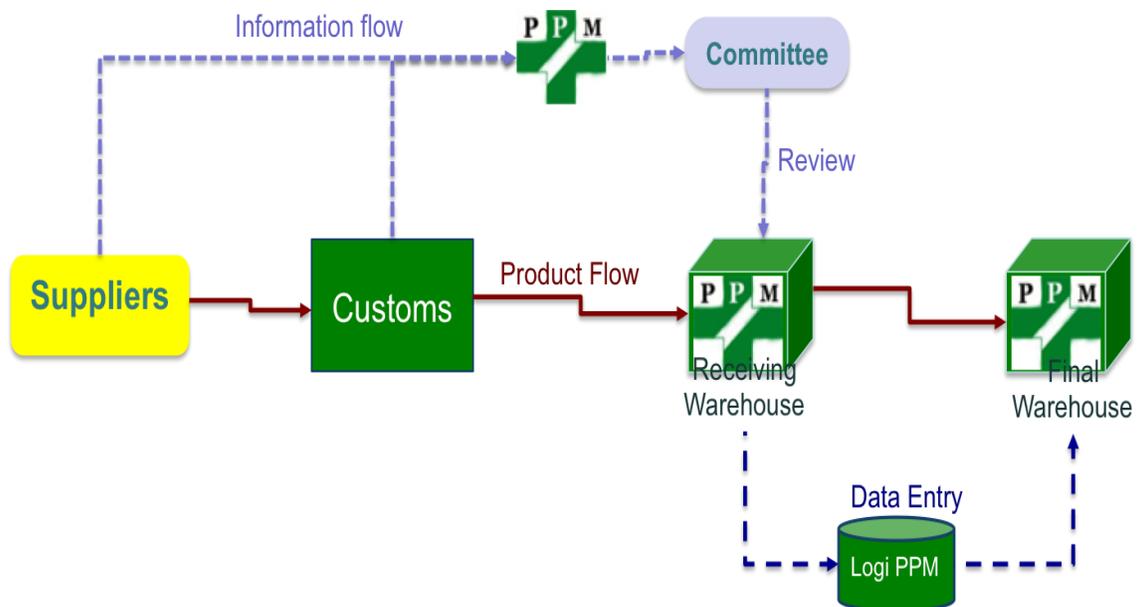


Figure 2: Receiving process

- Approximately 2,600 pallets of product are received annually in the PPM CMS; products, which are generally not palletized and vary in size, are received twice per week. However there is no established delivery schedule for suppliers.
- In each of the 10 warehouses, receiving is done by a storekeeper who is responsible for receipt of products and is assisted by daily workers.
- Inspection of product is done by a committee³ and usually focuses on verifying quantities and expiration dates; there is no visual inspection of the integrity of the boxes, the inner packages, or the products. There are no clear explanations for how inspections are currently performed.
- The product receipt and inspection form is only shared with the Procurement Department. Storekeepers and management are not informed of the outcomes.
- Documents used for receiving include the packing list, invoice, and customs form. These forms are provided by the transporter, freight forwarder, and customs agent, respectively.
- The receipt process is usually done within one week. It takes approximately 20 hours to put away all the products.
- There are written SOPs for the reception process, and the final drafts of these SOPs have been submitted to PPM for review, adoption, and formalization into PPM administrative tools.
- The receipt process is not fully automated (computerized). Products are counted manually and entered into LogiPPM system. No barcoding system is used.

Storage and Inventory Management

Although warehouse staff carefully monitor inventory and document stock status, storage remains one of the weakest areas in PPM's warehouse operations management, and storage facilities do not conform to the WHO guidelines on pharmaceutical storage. Findings from the rapid assessment are summarized below.

- The central warehouse (i.e., the 10 storage facilities in Bamako) stores approximately 2,600 pallets, based on the average number of boxes received.
- There are roughly 1,000 items stored at PPM, although only approximately 300 are frequently used. The average inventory turnover is approximately one year, but some items have variations of up to 17 months.
- Warehouses use manual stock cards for inventory control, although there is a computerized system, LogiPPM. The stock cards are managed by the storekeeper, who is responsible for regularly reporting on stock and for any losses that may occur in that store.
- Even with the use of LogiPPM, data on stock status (months of stock on hand) are not readily available to managers.

³ The committee usually comprises the PPM representative (pharmacist); persons from the MoH; a person from the quality side of the ministry; the person responsible for managing the warehouse in which the products should be stored (PPM has assigned specific warehouses for each group of products); and the representative from the program that owns the products (e.g., malaria program, HIV program, Global Fund). The committee varies depending on the products.

- PPM has established maximum and minimum stock levels for all products (max = 6 months; min = 3 months). No safety stock or emergency order point levels have been established.
- First expired first out is used to issue products from the warehouses. In addition, the lot numbers are used to manage inventory.
- Although indicators have been developed and can be useful for calculating the actual lead time of the suppliers, PPM is currently not doing this.
- PPM has not categorized its products as ABC or vital, essential, nonessential (VEN).
- Cycle counts are performed monthly, and complete physical inventories are performed quarterly. There are no established tolerances for discrepancies between the counted items and stock cards. These discrepancies are recorded monthly on the stock cards.
- PPM does not keep an item master file, a supplier master file, or a list of the different units of measure that are used.
- The PPM central warehouse has 20 major clients (eight in Bamako and 12 in seven other regions); however, regional and other PPM outlets have more clients, including private pharmacies and hospitals. Products are ordered based on need (pull); PPM does not push products downstream. Clients do not report their consumption to PPM.
- PPM has a clear policy for managing expired commodities and generally isolates and writes off expired inventory. Disposal follows MoH guidelines and involves departments outside of PPM.

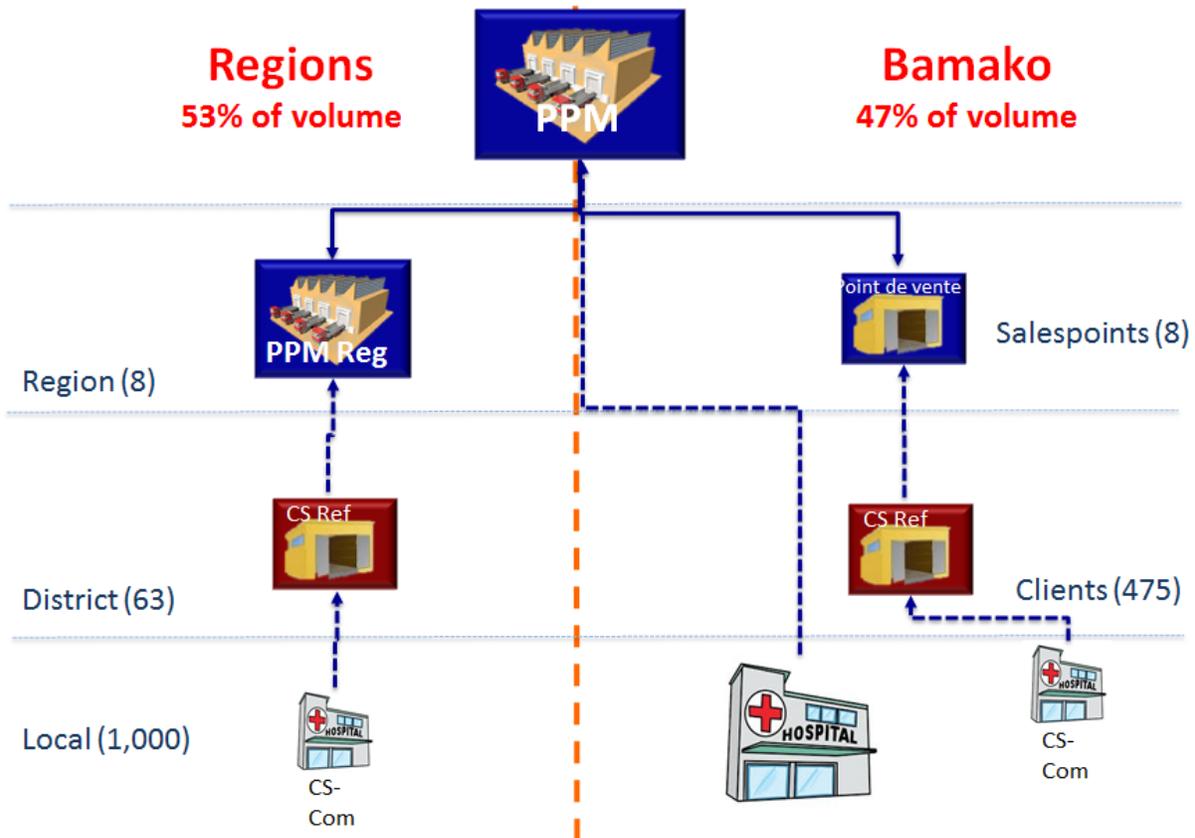


Figure 3: The order preparation and distribution process

Order Preparation and Distribution

- PPM assembles an average of 100 essential drug kits per day for distribution.
- The regions and districts are expected to order according to a three-month stock policy based on the logistics management information system (LMIS) SOP developed by the MoH of Mali; however, this is not always done. Based on the information captured by LogiPPM, it is possible for PPM to predict stock levels of regional warehouses and district storage facilities; such information can be used to develop a good distribution plan in the future. The Bamako districts place orders directly with and collect the products at PPM.
- Customer orders are generally prepared by five people, and a pick list is not used.
- PPM distributes to clients monthly using their own fleet of six vehicles, including one large truck, two medium-sized trucks, and three vans. Transportation services are rarely outsourced.
- Deliveries are not scheduled. One PPM staff member prepares the delivery forms.
- There is no system to measure either picking accuracy or order preparation quality compliance.
- PPM has no lead-time monitoring as part of its internal policy to measure how quickly it responds to clients' orders, but it is believed to be one month.

Reverse Logistics

All returned goods, regardless of whether they are designated for destruction, a quality check before restocking, or immediate restoration, usually undergo internal quality assurance procedures for recall/return, and information and data are usually updated in LogiPPM.

The quality manager is responsible for processing returns and completes the return form.

- *Products returned for withdrawal or recall of lot, defective, or outdated:* These products are destroyed and immediately stored in the waste disposal area or bonded if applicable.
- *Products rejected by the client:* The quality manager will verify compliance with product storage conditions during transport of products and conservation phases at the customer site, the expiration date, and the state of the packaging. Based on the assessment of quality assurance, these products will either be delivered in stock or stored in the disposal area for destruction.
- *Monitoring of actions:* PPM has a protocol to document the verification of the destruction of products and product information.

However, there is limited information/data to document the PPM protocol on rejecting or returning products from suppliers or other sources, such as donations and special program commodities procured by other agencies.

Information Technology Infrastructure

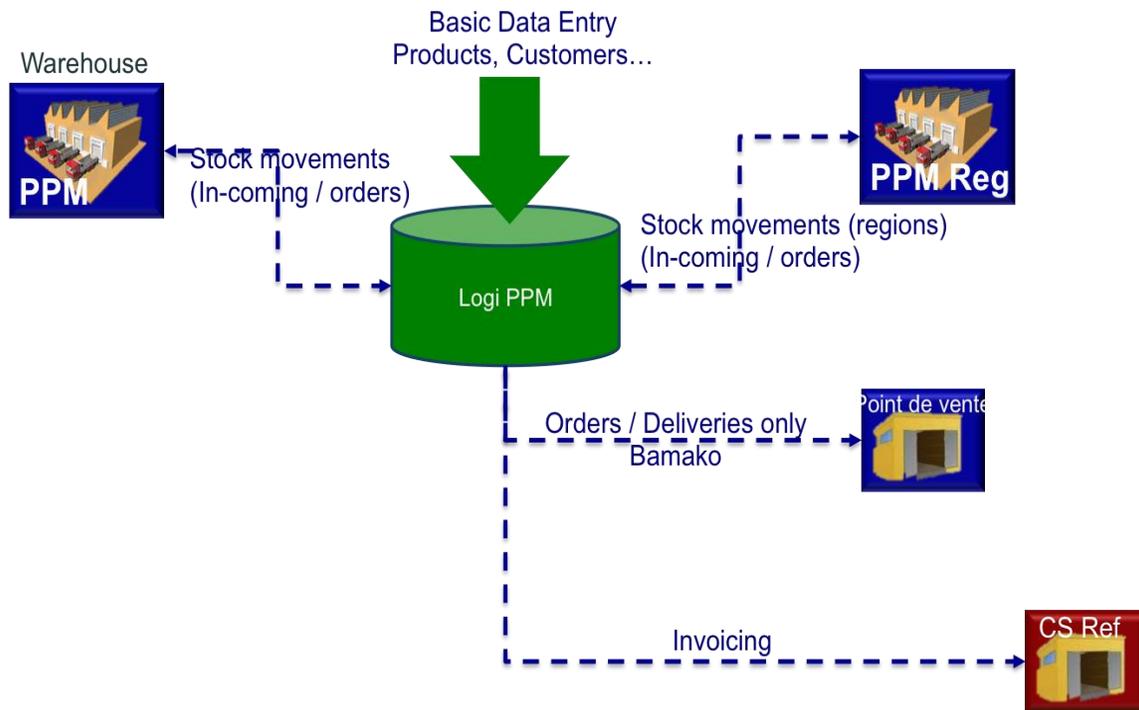


Figure 4: The PPM information IT network

- Computers at PPM are used by the IT Department to capture all stock movement information, including product reception; for stock keeping; and to create dispatch documentation (delivery forms) and invoices, which can be used for accounting purposes. The Warehouse Department uses a separate Microsoft Excel spreadsheet to record all stock transactions on a separate computer.
- Four staff members (two programmers and two managers) provide IT technical support; the IT team is responsible for day-to-day entries, upgrades and updates, and management of the overall information management system for PPM. In addition, an external consultant is responsible for any LogiPPM programming issues.
- There is no functional eLMIS in PPM.
- The Warehouse, Finance and Accounting, and IT Departments' stock data are not linked. This creates a significant gap in ensuring that PPM integrates stock information throughout the internal information system for better monitoring and quality assurance of the supply chain.

Figure 5 is a simplified map of the current information systems used within PPM.

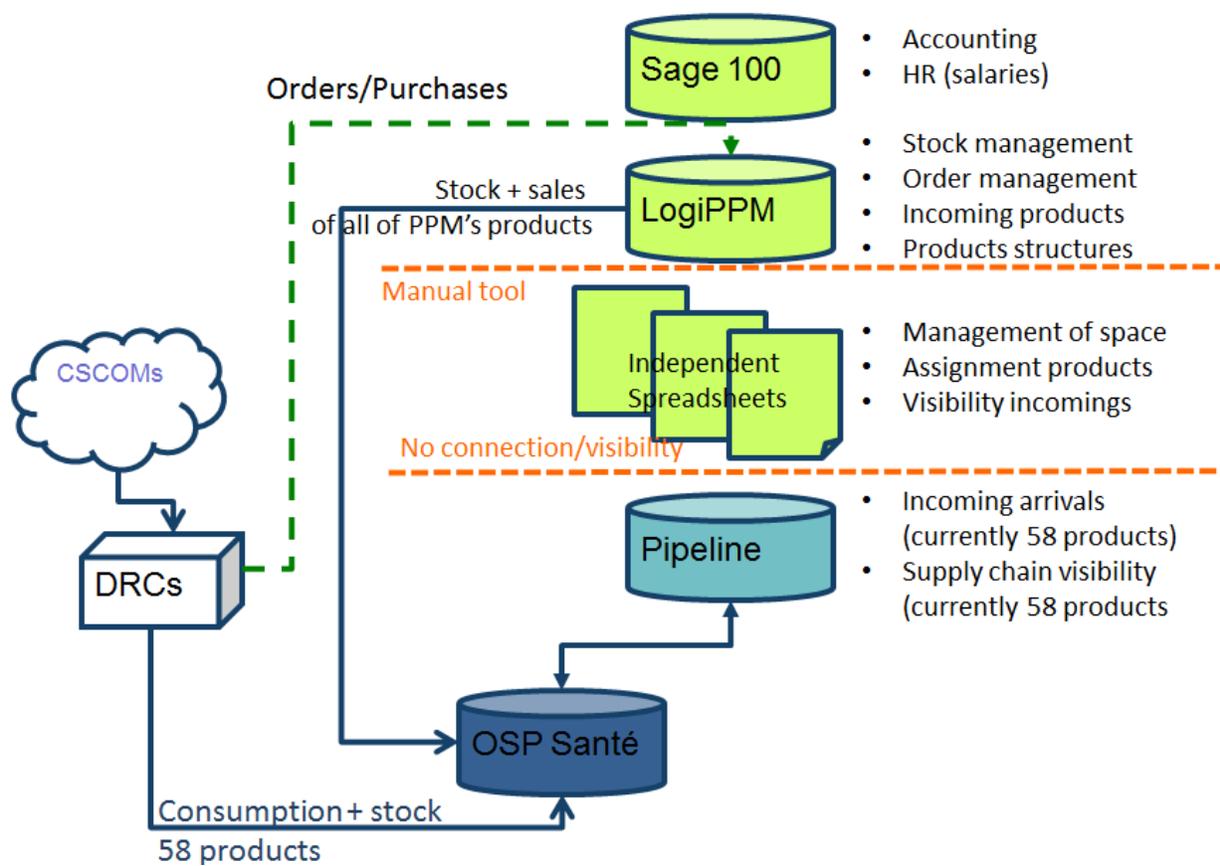


Figure 5: The current information systems used within PPM

- Sage 100 is used solely for accounting and employee payroll.
- LogiPPM was developed internally by PPM 10 years ago and is used to manage stock and prepare customer orders. It is not linked to other PPM systems. A software engineering consultant oversees its maintenance and development. Currently, there is only one consultant who can provide technical support, troubleshooting, or enhancements to LogiPPM.
- Excel spreadsheets have recently been added to institute better management and visibility of the spaces and the location of products within PPM.
- PipeLine is used for supply planning of the 52 priority commodities, including malaria, HIV, family planning, MNCH, and other selected medicines
- OSP Santé is used for tracking and reporting the actual consumption of malaria, HIV, family planning, MNCH, and nutrition commodities.

These systems are not linked and do not communicate with one another.

Human Resources Capacity

PPM staff were rated on a scale of 1 to 5 (1: No knowledge; 2: Basic knowledge; 3: Intermediate knowledge; 4: Adequate knowledge; 5: Proficient) on use of computer technologies. The average rating for all employees in the central warehouse in Bamako was 1.75, with only staff at the management level being considered to have intermediate knowledge. Each cadre was rated as follows:

WMS Gap Analysis Findings

Cadre	Rating (out of five)
Receipt clerks	1
Material handlers	1
Order pickers	1
Dispatch clerks	1
Warehouse supervisors	2
Storekeepers	2
Senior storekeepers	2
Management	4
Average	1.75

OPTIONS FOR PPM TO UPGRADE ITS WMS

During the discussions and analysis of viable options for the future, SIAPS and PPM discussed several scenarios:

1. Roll out Sage 100 to all of PPM⁴.
2. Enhance LogiPPM's functionalities.
3. Maintain the status quo with LogiPPM and other information systems.
4. Procure a new commercial WMS package from a reputable vendor.

The following factors were considered to ensure that PPM would select the most practical, modern, and feasible system:

- The ability of the selected system to perform warehouse management transactions and to link with other MISs used for accounting, HR, forecasting, and procurement and other LMISs, such as OSP Santé and PipeLine.
- The presence of a local company that could offer technical support for regular system maintenance, troubleshooting, and training.
- The cost of acquisition and system maintenance, including troubleshooting and upgrades.

Option 1: Roll out Sage 100 to All of PPM

- *Advantages:* Some PPM employees are already familiar with Sage 100 and use it for accounting and financial information management, which would help with training staff on basic system functionalities. Sage 100 can perform warehouse management transactions and be linked with other information systems. The company has an office in Bamako with technical support staff available to PPM.
- *Limitations:* Sage 100 will be obsolete in 2017, and the developer will no longer provide technical support on issues related to that version. Although the system will continue to function, it is critical for PPM and its operation that the software be up to date.

Option 2: Enhance LogiPPM's Functionalities

- *Advantages:* Enhancing LogiPPM to perform more WMS-like functions would reduce any potential learning curve because PPM staff already know the system.
- *Limitations:* LogiPPM does not have, nor will it have, features such as location management and product transfers, which are common in typical WMSs⁵. LogiPPM is not integrated with any of the current PPM information systems, including Sage 100; any web or modern development would be difficult and costly; and an investment would still be necessary to update LogiPPM and Sage 100 for accounting.

⁴ Sage 100 is the current system and is used only for accounting and finance.

⁵ <http://www.icepts.com/wp-content/uploads/2011/11/Top-10-Must-Have-Warehouse-Management-Systems-Features.pdf>

Option 3: Maintain the Status Quo with LogiPPM and other Information Systems

- *Advantages:* No financial investment; no learning curve.
- *Limitations:* Stock visibility would continue to be poor. PPM is and would remain entirely reliant on the availability of one person to provide technical support, troubleshooting, and system enhancements for LogiPPM, which is a significant long-term risk because no other software company can take over technical support. LogiPPM was developed to manage lot numbers rather than products, which makes it difficult to extract simple product-related information and very cumbersome to produce and monitor simple indicators. Finally, LogiPPM cannot be integrated with any other software.

Option 4: Procure a New Commercial WMS Package from a Reputable Vendor

- *Advantages:* A new WMS can be sourced with the required specifications for PPM and take into consideration the factors discussed previously, including the availability of in-country technical support and the ability to link with other information systems and perform day-to-day warehouse management transactions.
- *Limitations:* A new system would represent a relatively large financial investment, and there would potentially be a steep learning curve for staff to become proficient users.

Proposed Option: Option 4

Based on the WMS gap analysis findings and the analysis of information, SIAPS, in collaboration with PPM, evaluated the options and took into consideration:

- The capacity of the existing program, LogiPPM, to respond to current WMS demands and to link with Sage 100.
- PPM warehouse operations requirements and the future of PPM's LMIS.
- The availability of troubleshooting and technical support in Bamako.
- The need to integrate PPM finance, HR, warehouse operations, and external information systems, such as OSP Santé and PipeLine.

PPM requires reliable integrated software to manage its operations and cope with its continued growth and increasing responsibilities.

As PPM's operations increase, the warehousing requirements will also increase, including capacity, complexity in term of both product mix and clients, and increased throughput from a greater frequency of deliveries to a growing number of clients. In addition, with PPM's plan to expand to a new warehouse, a much more sophisticated and modern system will be necessary. This system should be able to:

- Plan needs for both products (demand management) and activities (warehouse processes according to the SOPs).

- Organize and improve the efficiency of warehouse operations, including assigning storage locations and improving picking and inventory accuracy.
- Improve visibility and information sharing with partners.

Because of how LogiPPM is built, these functionalities cannot be added, either now or in the future. Therefore, neither maintaining the tool as is nor enhancing it a viable option.

Sage 100 is able to perform some functions that are required for a WMS, so rolling it out beyond the Finance Department is an option; however, with the developer announcing that Sage 100 will be obsolete in 2017, PPM would still need to acquire an up-to-date system.

Given the advantages and limitations of the available options, it was recommended that PPM procure a new WMS package that will provide the option of linking accounting functions with warehousing and stock management operations as well as reliable and visible accounting of all its operations and activities to the MoH and its partners.

There are many ERP systems or WMSs that could fit PPM's requirements, and most systems are comparable. However, some practical concerns must be considered:

- PPM already uses Sage 100 for accounting and finance information management. The roll-out of another Sage product would be a logical step.
- Sage has an office in Bamako, and its five full-time employees have provided timely and helpful technical support.
- There is no other company in Mali that offers this type of software. This is a critical factor because training, maintenance, and support are crucial to the success of implementing any system.
- Sage is being used at similar facilities in neighboring countries, such as Côte d'Ivoire, and MSH has recently procured it to be used in Guinea's CMS.
- Implementation time for another Sage product would be shorter than setting up a new system. Based on the presentation by the Sage representative, the installation of the accounting system could be done in the matter of days, and the new WMS could be completed in a matter of weeks.

Therefore, the simple solution is to implement a Sage product. After reviewing the Sage product options and discussing them with Sage representatives and PPM staff, we identified Sage 100 Enterprise i7⁶ as the best option for the PPM WMS. The software is an integral solution for operations management, including accounting, warehousing, and stock management.

The new IT landscape could be designed as shown in the following figure:

⁶ The actual name of SAGE i7 can be found at <http://www.sage.fr/fr/logiciels/erp/pme/sage-100-entreprise-i7>.

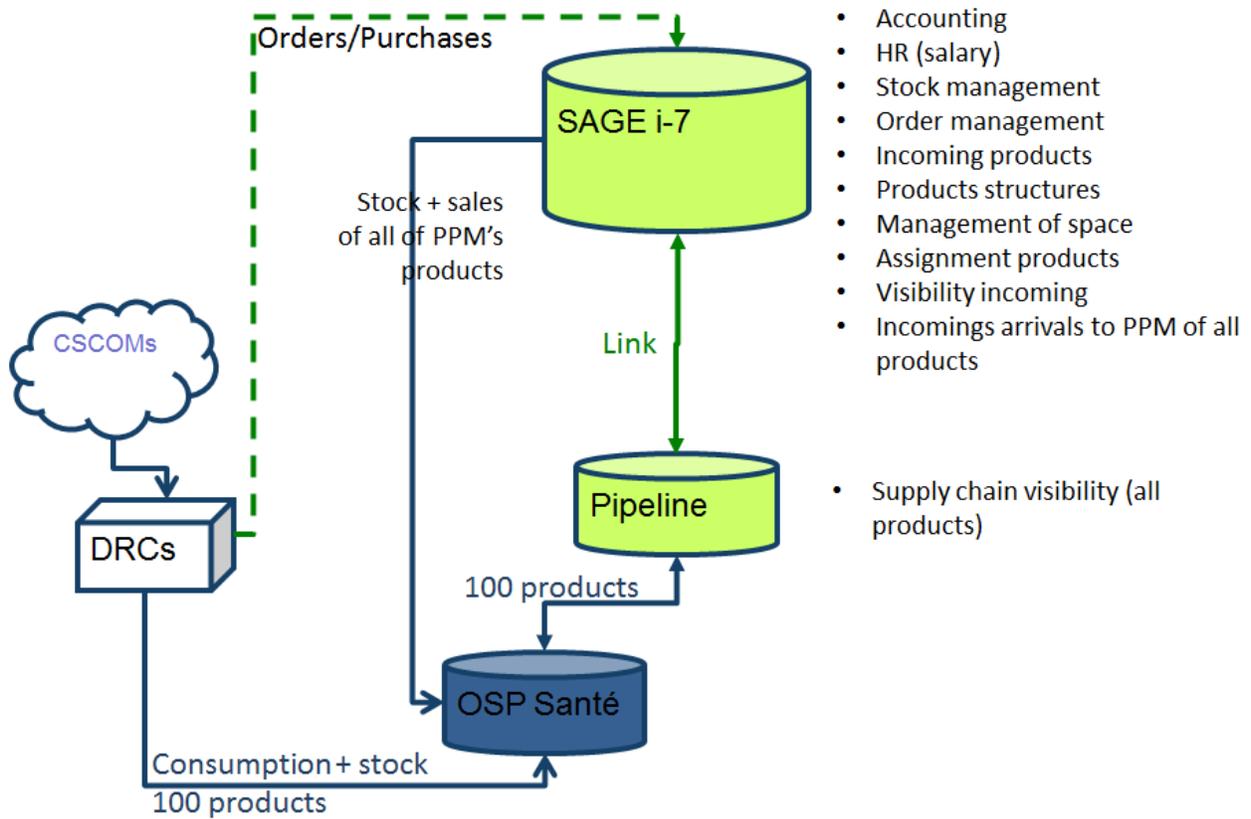


Figure 6: The new IT landscape

RECOMMENDATIONS AND NEXT STEPS

Following the last meeting between PPM and SIAPS on April 14, 2016, PPM decided to procure Sage 100 Enterprise i7 and work with Sage to install the system in the PPM central warehouse. The expected timeline for the procurement and installation of the new WMS was estimated to be approximately six to eight weeks. It is the opinion of authors of this report that much more needs to be done before the new WMS system can be successfully implemented at PPM.

Below are some important considerations for the successful implementation of the PPM WMS.

- *Preparation:*
 - Develop a change management strategy to support staff during the transition to a new system. In particular, there could be an increased workload for staff during the transition period as they work ensure that the phase-out of the older system and phase-in of the new system do not affect PPM's day-to-day activities.
 - Prepare for and invest in infrastructure, including computers, networks, and data security.
 - Complete the business process mapping, revise the forms and tools required by the process, and train staff to manage the new system.
 - Complete product profiling and inventory management SOPs.

- *Management of the WMS vendor:*
 - Develop a clear scope of work for the introduction of a new system, including the cost and timeline of each step (e.g., data migration, training, installation and upgrading of the system, decommissioning LogiPPM). The scope of work should detail the roles and responsibilities of each party involved in the new PPM WMS project.
 - Create a WMS project implementation team or task force comprising representatives from PPM, Sage, and SIAPS and other key IT/MIS players as needed.
 - Identify clear milestones, deliverables, and terms of reference for the vendor, and monitor these throughout the installation process.
 - Align the new system activation with other key activities in PPM, such as financial cycles, the stock-taking calendar, and procurement cycles.

- *The role of SIAPS in supporting PPM's new WMS project:*
 - Because the SIAPS Project is ending, PPM and SIAPS should create a plan that considers tight timelines and contingency plans in case the WMS implementation goes beyond the SIAPS Project close-out period.
 - Continue the SIAPS/IHS warehouse operations management processes technical assistance provided by the IHS consultant throughout the transition period to the new WMS.

- *Other considerations:*
 - Prepare for the new system by either upgrading the current computers or procuring new ones, and prepare for other IT infrastructure requirements after the installation phase.
 - Improve staff skills to work with new technologies that will be used in the warehouse (e.g., computers, WMS software, radio frequency identification). The current low level of computer and technology knowledge is one of the biggest risks and most important areas for improvement in PPM for the successful implementation of a new WMS.
 - Finalize the stock-keeping unit development for all products in PPM and develop the product master list.
 - PPM should approve the recently developed SOPs, which need to be institutionalized in the central warehouse.
 - PPM should continue to prepare for the migration to the new central warehouse once the construction is complete.

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ANNEX 1: APPROACH TO IMPROVING THE PPM WAREHOUSE MANAGEMENT SYSTEM

A WMS is a data-driven software tool that is used to manage the flow of materials into, through, and out of storage facilities by processing the transactions associated with each movement, from receiving and put-away to picking, packing, and shipping. WMS software relies on information systems and tools, such as computers, barcode scanners, radio frequency, and forms. These systems can either operate independently or serve as modules that connect with or are part of an ERP system. These planning systems support warehouse workers through standardized processes, instructions, rules, and parameters that are established during system implementation.

What Tasks Does a WMS Support?

A typical WMS can provide detailed directions for the receiving, storing, bin selecting, picking, and shipping tasks that are required in all warehousing operations. Using preset inventory thresholds, the system can also trigger reorders, and, if it has well-defined processes, a WMS can be used as a monitoring tool. In advanced systems, such as ERP systems, the WMS can operate as a resource management tool by linking warehouse operations with finance/administrative functions. A WMS supports all of the information processes within a storage facility that contribute to the flow of products, including:

- reception
- storage
- bin selection and replenishment
- picking/packing
- shipping
- reporting

What You Need to Know When Choosing a WMS

When considering a WMS, there are several minimum key features to look for, including:

- Adaptability, or how well the software can adapt to changes in the process and whether it can be adapted to other functional software, such as an ERP system.
- Visibility, including real-time information availability, summarized reports, and dashboards.
- Traceability, such as linkages between batch/lot numbers, production orders, and reception lists.

Benefits of Implementing a WMS

Although a WMS will not in itself reduce inventory levels, if it is properly implemented, it can help organize the processes within the storage facility and provide greater visibility of stock status. Inventory levels will decrease with good data usage and proper system management.

Studies on WMS implementation have shown that the benefits of using a WMS to automate warehouse processes include a 20% average increase in inventory accuracy and a 27% average decrease in the costs of carrying inventory.

Approach to Implementing a WMS

Based on experience and a literature review, a systematic process with the following steps has been proposed:

1. Perform a system gap analysis (as-is) and analyze available options (to-be) for a new WMS using a structured information-gathering tool (annex 1).
2. Based on the options analysis, design a specific, tailored WMS intervention to fit PPM's warehouse operations management system.
3. Procure and install the selected WMS based on the outcomes of steps 1 and 2.
4. Implement and manage the WMS.
5. Monitor performance.
6. Measure outcomes.

In terms of ownership and sustainability, the core principles of the approach include local ownership and leadership; involvement of PPM staff, local consultants who are conversant in WMSs, and partners to ensure there is a foundation of local capacity building; and solutions that are locally appropriate and sustainable without ongoing external support.

Table 1 outlines the required activities for the introduction and implementation of PPM's WMS.

Table 1: Roadmap for selecting and installing PPM’s WMS

Phase	Key Activities	Timeline	Output	Responsible party	Comments
Preselection phase	Define the goal and obtain stakeholder buy in and commitment	August 2015	Activity approval	SIAPS, PPM	The activity must be driven by PPM and supported by SIAPS
	Identify the technical team, comprising internal and external technical staff and experts, to perform the WMS gap analysis; select the software; and manage the procurement, deployment, and implementation of the WMS.	August 2015	The technical team comprises PPM and SIAPS (Mali and headquarters) staff, MIS consultants who lives in Mali, and IHS and Agence Nationale de Telesante et d’Informatique Medicale (ANTIM) staff	SIAPS, PPM	The team composition can be updated based on new technical expertise needs
	Conduct a structured situational analysis of the existing warehouse operations management system, including tools, processes, HR and financial capacity, infrastructure, reports, and capabilities of the supply organization	September to October 2015	Situational (WMS gap) analysis report	SIAPS, IHS, PPM	This process will begin with assessment tool development, validation, and pretesting
	Based on the situational analysis, gauge the maturity of PPM’s existing warehouse processes. Identify and analyze possible WMS options. Identify the most appropriate WMS option from the options analysis.	October 2015 (2 weeks short-term technical assistance (STTA))	Options analysis and recommendation for an appropriate PPM WMS	PPM, SIAPS, ANTIM	The analysis process will include other stakeholders from the MoH and ANTIM, MIS experts, and development partners
	Define the scope, scale, and specifications of the desired system based on the factors considered in the above steps.	October 2015 (2 weeks during the STTA)	Document specifying the type of WMS to be sourced, with detailed specifications of the requirements	PPM, SIAPS, IHS, ANTIM	
	Optimize the warehouse’s existing processes as a preparatory stage to establishing an effective WMS	August to November 2015	Reorganized, optimized warehouse processes	PPM, SIAPS, IHS	This is part of the continuous TA by SIAPS and IHS to PPM

Phase	Key Activities	Timeline	Output	Responsible party	Comments
Selection phase (procurement process for the WMS)	Draft the bidding document for the desired system identified in the preselection phase	October 2015	Competitive bidding or sole-source justification document finalized	PPM and SIAPS	PPM opted for a sole-source procurement
	Source the appropriate WMS	December 2015	Supplier bids submitted; competitive bidding/tender; contract awarded	PPM	SIAPS may be involved in the actual procurement only if it will be procuring the WMS on behalf of PPM
Postselection phase (WMS implementation)	Customize, test, implement, and monitor the WMS and develop an evaluation plan for postimplementation review	January 2016	WMS implementation plan approved by PPM	PPM, vendor, SIAPS	Customization will be done in consultation with other government of Mali entities responsible for health MIS
	Deploy and commission the new WMS	January 2016	Functional WMS installed at PPM	PPM, vendor, SIAPS	The appropriate infrastructure (computers and IT network) should be ready before the vendor installs the new system
	Train relevant warehouse staff in optimized warehouse processes and the new WMS	January to April 2016	Trained staff who can use the WMS as required	Vendor, PPM	
	Conduct a baseline technical evaluation of live system performance against specifications and/or requirements using defined key performance indicators (KPIs).	April 2016	Baseline KPIs established	PPM, SIAPS, vendor	Selected KPIs will be periodically monitored to track the progress of PPM performance improvement
	Conduct ongoing system performance monitoring using the same KPIs	Ongoing after installation	PPM performance reports	PPM	This will be a continuous process

ANNEX 2: WMS GAP ANALYSIS INFORMATION-GATHERING TOOL

Receipt and Inspection

- 1- How many docks are dedicated for receiving incoming shipments? _____
 - a. Are all docks identified by a location code? (Y/N) _____
- 2- Is there a staging area (dedicated) for receiving and inspecting commodities? (Y/N) _____
 - a. Is it identified by a location code? (Y/N) _____
- 3- Is there a quarantine area for commodities that do not meet inspection requirements? (Y/N) _____
 - a. Is it identified by a location code? (Y/N) _____
- 4- How many times per week does the warehouse receive products? (use number) _____
- 5- How many pallets per week does the warehouse receive? (use number) _____
- 6- Does the warehouse receive bulk products (not palletized)? (Y/N) _____
- 7- Is the receipt process automated/computerized? (Y/N) _____
- 8- What technology is used for the receipt process? _____
- 9- How many employees are dedicated to the receipt and inspection process? _____
- 10- Do the receiving personnel use documentation for the receipt process? (Y/N) _____
 - a. If "Y", please select the document(s) used.
 - Packing list
 - Invoice
 - Purchase order
 - Other (please specify) _____
- 11- How do they obtain these documents? _____
- 12- Are these documents available prior to receipt of the products? (Y/N) _____
- 13- Is there a stock receipt form available? (Y/N) _____
 - a. If "Y", are potency, expiration dates, and lot numbers documented on the receipt form? (Y/N) _____
 - b. Please provide a copy of the form as an annex.
- 14- Are commodities inspected on arrival? (Y/N) _____
- 15- What types of inspections are performed (select all that apply)?
 - Visual (size, color, odor, shape, etc.)
 - Quantities
 - Expiration dates
- 16- Are copies of the completed receipt forms kept on file? (Y/N) _____
- 17- The completed receipt form is shared with (select all that apply):
 - a. Procurement
 - b. Storekeeper
 - c. Management
 - d. Other (please specify) _____
- 18- Are cold chain commodities taken to a refrigerated area on arrival? (Y/N/NA) _____
 - a. Is the temperature of cold chain commodity recorded on the receiving form? (Y/N/NA) _____
- 19- Are controlled substances received directly to the vault/secure area? (Y/N/NA) _____
- 20- Does the PPM central store receive commodities for cross-docking? (Y/N) _____
 - a. If so, do these commodities go directly to the shipping area? (Y/N) _____
 - b. If "N", to what area of the warehouse do they go?

- c. Are these commodities registered on the stock receipt form? (Y/N) _____
- 21- Once received, where do the commodities for stock go? _____
- 22- For material not processed because of missing receipt information, is there a segregated space within the receiving area identified for incomplete receipts? (Y/N) _____
- a. Is it identified by a location code? (Y/N) _____
- 23- How many hours does the receipt and inspection process typically take?

- 24- Are there written standard operating procedures for the reception process? (Y/N) _____
- a. If "Y", please provide a copy.
- 25- Are there written standard operating procedures for the inspection process? (Y/N) _____
- a. If "Y", please provide a copy.
- 26- Are there written standard operating procedures for processing returns? (Y/N) _____
- a. If "Y", please provide a copy.
- 27- Provide a simple diagram of the processes undertaken in receipt and inspection.
- 28- Please write a brief narrative description of the reception and inspection procedures and explain any gaps that need to be addressed before introducing new system or upgrading the current system (LogiPPM).

Storage

- 1- Are there specific areas for storage in the warehouse? (Y/N) _____
- a. Are these areas identified by a location code? (Y/N) _____
- b. Are the storage locations adequately labeled to facilitate location of the product? (Y/N) _____
- c. Please name the areas in the warehouse

- 2- How many storage locations are available in the warehouse? _____
- 3- Do the storage locations have stock control or bin cards? (Y/N) _____
- 4- Do the storage locations have barcodes for easier recording of commodity locations? (Y/N) _____
- 5- How many hours does it take to put away new stock? _____
- 6- Are the storage locations organized with shelving and/or racking units? (Y/N) _____
- 7- Are commodities stored on the floor? (Y/N) _____
- 8- Are commodities stored on pallets? (Y/N) _____
- 9- What is the average number of pallets stored in the warehouse? _____
- 10- Are the commodities stored by (select all that apply):
- Alphabetical order
 - Random bin
 - Therapeutic or pharmacologic category
 - Form or dosage
 - Other (please specify) _____
- 11- Are commodities that can expire stored by first expired first out? (Y/N) _____
- 12- Are commodities that do not expire stored by first in first out? (Y/N) _____
- 13- Are expired commodities transferred from the stocking location to a quarantine area for disposal? (Y/N) _____. If no, what happens to the expired stock (please explain)?

- 14- Is there an area for cold storage? (Y/N) _____
- 15- Is the temperature in this cold storage area monitored daily? (Y/N) _____
- a. Is a record of monitoring kept? (Y/N) _____
- 16- Are controlled substances (e.g., narcotics) stored in a dedicated area that is subject to appropriate safety and security measures? (Y/N) _____
- 17- Are flammable commodities stored in their original containers? (Y/N) _____
- a. In a separate location away from normal stock? (Y/N) _____
- b. In a secure, well-ventilated, and cool facility? (Y/N) _____
- c. Out of direct sunlight? (Y/N) _____
- 18- Are there written guidelines available at PPM regarding storage conditions? (Y/N) _____
- a. If "Y", please provide a copy.
- 19- Please provide a descriptive narrative of the storage situation and explain any noted gaps in the warehouse/storage practice that needs to be addressed for a WMS to be effective and efficient.

Inventory Management and Master Data Infrastructure

- 1- Is there a master item file (catalog/product master)? (Y/N) _____
- 2- Is there a supplier master file? (Y/N) _____
- 3- Is there a catalog for the different units of measure used at PPM? (Y/N) _____
- 4- Does PPM use a product category system for inventory management? (Y/N) _____
- a. If "Y", select all that apply
- ABC
 - VEN
 - Mix
- 5- Is the inventory management system:
- a. Computerized
 - b. Manual
 - c. Both

Provide a description of the system and, if possible, any illustrations or flowcharts on how information is managed.

- 6- If the inventory management system is manual, does PPM use bin cards/stock cards to keep track of receipts, issues, and discards? (Y/N)
- a. If "Y", please provide a copy.
- 7- Are data on stock status (months of stock on hand) routinely available to managers? (Y/N)
- _____
- 8- Are material location changes recorded in the inventory management system? (Y/N/NA)
- 9- How often are cycle counts performed?
- Daily
 - Weekly
 - Monthly
 - Quarterly
- 10- How often are complete physical inventories performed?
- Quarterly
 - Every six months
 - Annually
- 11- Is there a form for counting? (Y/N) _____
- a. If "Y", please provide a copy.

- 12- Is inventory accuracy measured? (Y/N) _____
a. If "Y", are there defined accepted tolerances for different product categories?
b. What are the accepted tolerances for
- ABC
- VEN
- 13- How is the record accuracy calculated? _____
- 14- Are any discrepancies found during cycle count/physical inventory recorded on stock-keeping records? (Y/N) _____
- 15- Does PPM establish a stocking policy for the maximum stock level? (Y/N) _____
a. What is that level? _____
- 16- Does PPM establish a stocking policy for the minimum stock level? (Y/N) _____
a. What is that level? _____
- 17- Does PPM establish a stocking policy for the safety stock level? (Y/N) _____
a. What is that level? _____
- 18- Does PPM establish a stocking policy for the emergency stock level for placing emergency orders? (Y/N) _____
a. What is that level? _____
- 19- How often are these levels reviewed? _____
- 20- Does PPM keep track of the lead time for each supplier? (Y/N) _____
- 21- Is the reorder point defined by a stock level (e.g., minimum) or a time interval

a. If it is a time interval, that interval is
- Weekly
- Monthly
- Quarterly
- Every six months
- 22- What formula is used for reordering? _____
- 23- How many individual items are kept in inventory? _____
- 24- What is the average turnover? _____ Outline any identified gaps in the system and how can they be addressed for the PPM inventory management to comply with any advanced/sophisticated WMS.
- 25- Is there a documented process for managing expired products? Please describe _____

Order Preparation (Pick/Pack/Dispatch)

- 1- Does PPM have a push system to the clients served, or do they pull from PPM? _____
a. If pull, does PPM receive customer orders/requisitions for resupply? (Y/N) _____
b. If push, does PPM receive consumption reports from clients? (Y/N) _____
- 2- Do quantities for dispatch need to be approved? (Y/N) _____
a. If "Y", by whom? _____
- 3- Is there a standard operating procedure for order picking? (Y/N) _____
a. If "Y", please provide a copy.
- 4- Is there a standard operating procedure for order packing? (Y/N) _____
a. If "Y", please provide a copy.
- 5- Are product requests pulled using a pick list? (Y/N)
- 6- How many clients/facilities are supported by PPM? _____

7- Please list the names and region/province/district of these clients.

Client Name	Region

8- Are prepacked MoH essential drug kits assembled in the warehouse? (Y/N) _____

- a. How many:
- Per day _____
 - Per week _____
 - Per month _____

9- Does PPM schedule its deliveries? (Y/N) _____

10- Which are the 10 fastest moving products in PPM?

Product name	Average number of units/product lines dispatched
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

11- How many deliveries per week does PPM make to its customers? _____

12- What is PPM's frequency of distribution?

- Monthly
- Quarterly
- Every six months
- Other (please specify) _____

13- What is PPM's lead time for fulfilling customer orders? _____

14- Does PPM use its own vehicles for distribution? (Y/N) _____

- a. If "Y", how many vehicles? _____

15- Does PPM use contract transport providers for distribution? (Y/N) _____

Reverse Logistics Management

1- What percentage of product lines is returned **to the** warehouse from customers on a monthly basis (number of product lines returned in a month/total lines dispatched in a month)? _____

Month	Number of product lines returned	Number of product lines dispatched
Jan		
Feb		
Mar		
Apr		
May		
Jun		
Jul		
Aug		
Sep		
Oct		
Nov		
Dec		

2- Are the returned products received into quarantine? (Y/N) _____

3- Are the quantities of returned products recorded into stock-keeping records? (Y/N) _____

a. If "Y", what record? _____

4- Does PPM keep a log of reasons why products are returned **from the customers** for statistical and decision-making purposes? (Y/N) _____

a. If "Y", what are the most frequent causes of product return?

5- What percentage of product lines does PPM return to its suppliers on a monthly basis? (number of product lines returned in a month/total lines dispatched in a month)? _____

Month	Number of product lines returned	Number of product lines dispatched
Jan		
Feb		
Mar		
Apr		
May		
Jun		
Jul		
Aug		
Sep		
Oct		
Nov		
Dec		

6- Does PPM keep a log of reasons why products are returned **to the supplier** for statistical and decision-making purposes? (Y/N) _____

a. If "Y", what are the most frequent causes of product return?

- 7- Are products placed in quarantine prior to being returned to the supplier? (Y/N) _____
- 8- Are the products that are placed in quarantine deducted from the stock-keeping records in the storage area? (Y/N) _____

IT Infrastructure

- 1- Does the warehouse use computers?
- 2- If "Y", please specify the use:
 - a. Recording product reception (Y/N) _____
 - b. Electronic stock-keeping records (Y/N) _____
 - c. Calculating order quantities (Y/N) _____
 - d. Stock reports (Y/N) _____
 - e. Storage location reports (Y/N) _____
 - f. Generating pick lists (Y/N) _____
 - g. Product issuing (Y/N) _____
 - h. Dispatch documentation (Y/N) _____
 - i. Other uses: _____
- 3- How many computers are used in the warehouse? _____
- 4- What operating system(s) is used on the warehouse computers? _____
- 5- Is there an LMIS in place? (Y/N) _____

Human Resources Capacity

- 1- How many people work in the PPM warehouse? ____
 - a. How many people receive and inspect stock? ____
 - b. How many people handle materials in the storage area? ____
 - c. How many people pick orders? ____
 - d. How many people pack products/assemble kits? ____
 - e. How many people perform dispatch documentation? ____
 - f. How many storekeepers? ____
- 2- Are staff trained to perform their warehouse tasks? (Y/N) ____
- 3- How often are trainings refreshed? _____
- 4- Rate the computer/electronic device use proficiency of PPM warehouse staff in the different areas (1: No knowledge; 2: Basic knowledge; 3: Intermediate knowledge; 4: Adequate knowledge; 5: Proficient)
 - a. Receipt clerks _____
 - b. Material handlers _____
 - c. Order pickers _____
 - d. Dispatch clerks _____
 - e. Warehouse supervisors _____
 - f. Storekeepers _____
 - g. Senior storekeepers _____
 - h. Management _____
 - i. Other _____
- 5- Is there IT support staff in the warehouse? (Y/N)
 - a. If "Y", how many people are on the team? _____