■ INTRODUCTION ARTICLE

# Private Maintenance Contracting (PMC) for Public and CHAM Physical Assets in Malawi

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JAHS 1 (2): 1-10, 2010. Submitted June 21, 2010. Accepted July 12, 2010.

**ABSTRACT:** Japan supported the Project "Strengthening of Physical Assets Management (PAM) and Maintenance Programmes" for 4 years from July 2006 to June 2010 in Malawi (hereinafter referred to as "JICA PAM Project"). A lot of trainings were conducted for the skill development and enhancement of the staff engaged in the management and maintenance of Governmental and CHAM (Christian Health Association of Malawi) health facilities. On the system design of the medical equipment management and maintenance, the Standardization Equipment List according to the service level / function / type of facilities was established. In addition, concept of first line planned preventive maintenance (PPM) by equipment users was introduced and training programmes were held in almost all public health facilities and CHAM hospitals.At the same time, the German Government through KfW has submitted a pioneering project proposal to the government of Malawi designed to contract out the maintenance of medical equipment in the Government and the CHAM health facilities through the so-called to Private Maintenance Contracting (PMC) on a full turn-key scheme.This report is to consider how harmonize the human resource capacity building by introducing the various types of training programmes, and the outsourcing from the private sector.

**Key words:** Medical Equipment Maintenance, Outsourcing, PPP (Public Private Partnership)

## Abbreviations used in this Article

| | |
|---|---|
| AOP | Annual Operation Plan |
| CH | Central Hospital |
| CHAM | Christian Health Association of Malawi |
| CHMU | Central Hospital Maintenance Unit |
| CM | Corrective Maintenance |
| DHMT | District Health Management Team |
| DHMU | District Hospital Maintenance Unit |
| DHO | District Health Officer, or District Health Offices |

| | |
|---|---|
| EHP | Essential Health Package |
| EU | European Union |
| GTZ | Deutsche Gesellschaft fur Technische Zusammenarbeit |
| HQs | Head Quarters |
| HTSS | Health Technical Support Services |
| JICA | Japan International Cooperation Agency |
| MEC | Medical Equipment Centre |
| MMR | Maternal Mortality Rate |
| MOH | Ministry of Health |
| MT | Maintenance Technician |
| OPC | Office of the President and Cabinet |
| PAM | Physical Assets Management |
| PDM | Project Design Matrix |
| PHSA | Provincial Health Services Authority |
| PLAMAHS | Planning & Management of Assets in the Healthcare Services (the Software for Medical Equipment Management and Maintenance) |
| PMC | Private Maintenance Contractor / Contracting |
| PPM | Planned Preventive Maintenance |
| PPMU | PAM Project Maintenance Unit |
| RMUs | Referral Maintenance Units |
| SMS | Senior Maintenance Supervisor |
| ZHSO | Zonal Health Support Office |

# CHAPTER 1: INTRODUCTION

## 1.1 Country Profile[1]

### (1) Geography

Malawi is a landlocked country south of the equator in sub-Saharan Africa. It is bordered to the north and northeast by the United Republic of Tanzania; to the east and southwest by the People's Republic of Mozambique, and to the north and northwest by the Republic of Zambia. It is 901 kilometres long and ranges in width from 80 to 161 kilometres. The total area is 118,484 square kilometres of which 94,276 square kilometres is land area. The remaining area is mostly composed of Lake Malawi, which is about 475 kilometres long and runs down Malawi's eastern boundary with Mozambique.

The country is divided into three regions: the Northern, Central and the Southern Regions (now divided into south and south eastern regions). There are 28 districts in the country. Six districts are in the Northern region, nine are in the Central Region, and 13 are in the Southern and South Eastern Regions. It has 4 major cities or urban sites, Lilongwe, the capital city, Blantyre, considered as the industrial centre, Mzuzu in the north and Zomba the old capital city.

Malawi became an independent state and gained republic status in 1964. In 1994 Malawi adopted a multi party system and a strategy to eradicate poverty. Since then, it has introduced free educational system for primary school, a free market economy, a bill of rights, and a parliament with 3 main parties. Over the past 10 years, the country has experienced a considerable increase of rural-to-urban migration.

[1] Reference No. 1.

### (2) Economy

Malawi is predominantly agricultural economy. Agricultural produce accounted for 70% of Malawi exports in 2004, tobacco, tea, and sugar being the major export commodities. The country is largely self-sufficient with regard to food, but in recent years it had experience food insecurity. In the past years though, Government subsidised fertilizer inputs for farmers, thus supply of maize and other prime farm produce for export have risen. Per capita in Malawi is at USD 690 and the total expenditure on health per capita is USD 70. Total expenditure on health as percentage of GDP is 12.3%.

### (3) Population

The population of Malawi grew from 8.0 million in 1987 to 9.9 million in 1998, representing an increase of 24 % or an intercensal population growth rate of 2% per year. Population density increased from 85 persons per square kilometre in 1987 to 105 persons per square kilometre in 1998. In the same reference, the population intercensal growth rate ranges from 3.2% - 3.3% (2000-2002) and crude birth rate of 50.8% in 2002. Officially, the present population of Malawi is close to 13.1 million, 85% of which live in the rural areas and only 15% are in the urban areas.

To address problems associated with rapid population growth, in 1994 the Malawi Government adopted the National Population Policy, which was designed to reduce population growth to a level compatible with social and economic goals (OPC 1994). The policy's objectives are to improve family planning and health care programmes, to increase school enrolment with an emphasis on raising proportion of female students to 50% of total enrolment, and to increase employment opportunities, particularly in the private sector.

## 1.2 Health Sector in Malawi[1]

### (1) Key Health Problems

Malawi's epidemiological profile is sill characterized by infectious or communicable diseases. The major burden of disease is due to conditions such as malaria, HIV/AIDS, TB, STD/infections, diarrhoea and acute respiratory infections. In most facilities malaria cases can contribute up to 35 % of outpatient attendances. These disease burden and the poor nutritional status of children, whereby 5% of under fives are wasted (severely malnourished), 22% underweight, and 48% stunted, and up to 73% of children between ages of 6-59 months have been found to be anaemic, aggravate the already dire situation.

Conditions affecting maternal and neonatal health contribute significantly to the country's burden of disease. Factors associated with increased maternal mortality in Malawi include poor access to obstetric care services and inadequately equipped and/or poorly supplied health facilities.

### (2) Demographic Parameters and Key Health Indicators

Malawi has a population of 11.2 Million people (2002), an estimated growth rate of 3.3 and an estimated life expectancy of 42.8 years (male) and 45 years (female). Women of child bearing age constitute 53.1% of the female population. The crude death rate for the country is 50.8%, a total fertility rate of 6.0% and a crude death rate of 19.4%. The HIV prevalence remains at 12% in the age group 15-49 years. Hypertension ranks high as 32% of adult population with 25-64 years old are hypertensive. MMR is one of the highest worldwide at 807, IMR, at 169 per 1,000 live births and under five mortality at 122.

## 1.3 Health Services Administration

[1] Reference No. 1.

### (1) The Ministry of Health (MOH) and Health Services Delivery Platform

The levels of health system in Malawi comprises of the Central Ministry of Health, the Central Hospital, the Zonal Health Support Offices (ZHSO), the District (Hospital) level including CHAM and the Health Centre level (including the Maternity Units and Dispensaries). Malawi has 3 tiers health care delivery system, namely; *primary, secondary and tertiary.*

The roles and responsibilities of Central MOH (HQs) are policy development, review and enforcement, stewardship, regulation of the sector and donor coordination, resource mobilisation for the Essential Health Package (EHP), budget review and analysis, human resource planning and development, provision of high level technical support to the operational level, among others. "The goal of the Ministry of Health (MOH) and its partners is to raise the level of health status of all Malawians by reducing the incidence of illness and occurrence of premature deaths in the population".

The main strategy to achieve this goal is through the delivery of a cost effective package of health services, the EHP. This package has the potential to deal with more than 90% of the causes of morbidity and mortality in Malawi. The package of services consists of the prevention, treatment, referral and control of disease conditions. The MOH determined the cost of the EHP to be equivalent to US$ 17.53 per capita per annum. To ensure maximum benefit by the poor, it is Government policy that the EHP will be provided "free" of charge at the point of delivery at all public health facilities irrespective of their socio-economic status.

### (2) The Central Hospital Level

Malawi has 4 Central Hospitals, namely: Mzuzu Central Hospital in Mzuzu, Kamuzu Central Hospital in Lilongwe, Queen Elizabeth Central Hospital in Blantyre and Zomba Central Hospital. There is one mental Hospital located in Zomba as well. Central hospitals provide the highest level of referral care in Malawi in support of EHP cases referred from both the public and private sectors. It provide tertiary level of care.

### (3) The Zonal Health Support Offices (ZHSOs)

There are five ZHSOs, North, Central East, Central West, Southern East and Southern West. They have been established to provide direct technical and supervision support for the District Health Management teams. Its functions are to provide policy guidance and technical support, to coordinate in-service training for district staff, to facilitate planning and delivery of EHP services, among others.

### (4) The District (Hospital) Level including CHAM

This level provides referral support for EHP cases from CHAM institutions, Health Centres, maternity and dispensaries and also provides technical supervision and support. Health services at this level are managed by the District Health Management Team (DHMT) headed by the District Health Officer (DHO). It receives direct technical support and supervision from ZHSO.

The core functions of the DHO and the DHMT are implementation of health policies, support and supervision to health facilities within the district, planning, implementation and monitoring of the delivery of EHP services, staff management, development and deployment of health staff, among others.

### (5) The Health Centre level (Including maternity clinics and dispensaries)

The Health Centre services combined with those of the district level can effectively deal more than 90 % of the health care demands and

reduce the burden of disease by up to 30 % in Malawi. The health centre staffs are expected to interact with the communities they serve through appropriate development structures such as health centre and village health committees.

Because EHP services cannot be delivered in a vacuum the service package includes strengthening and development of support systems, *to include laboratory services, minimum standard of health facility infrastructure, equipment according to standard equipment list and appropriate number of trained and motivated staff.* In terms of ensuring availability of essential basic medical equipment in all health facilities, PAM can create a big impact in this area, thus ensuring that the objectives of the MOH through its EHP are achieved.

### (6) Public Health Care System

The health service system in Malawi is provided free by the Government through its facilities across the country (approx 50%), the CHAM health facilities approximately 16% and the private sectors including NGOs and private companies at 34%. Currently, there are 28 district hospitals and 21 CHAM hospitals. These hospitals have more comprehensive staffing level, facilities and equipment compare to the private sector. They are used as referral services to health centres, clinics ( private and public ) and CHAM facilities.

The 4 central hospitals and 1 mental hospital provide specialist referral services to the district hospitals. There are 19 rural hospitals which are complemented by the recently introduced community hospitals that provide intermediate services between the district hospital and the health centre by providing limited referral services, including X-ray and theatre facilities.

There are 428 private health providers across the country providing mostly curative care. This number comprises of diagnostic centre (3), hospital (4), dental clinic (7), pharmacy drug store (20), and a big slice of health centre, maternity, dispensary, surgery (394).

The public hospitals and CHAM are said to be relatively better equipped than its counterparts in the private sector, though not necessarily adequate. Infrastructure wise, public and CHAM hospitals are better off than most of its counterpart in the private sector. Health workers and health staff shortage is endemic in Malawi, therefore this is a challenge in both the public and private hospitals.

However, as pointed out earlier only the public hospitals have an organized healthcare maintenance service units in almost all levels of the referral system.

## CHAPTER 2: JICA PAM PROJECT

### 2.1 Background of the JICA PAM Project

In May 2006, another landmark agreement was signed by the 2 countries, Japan, represented by JICA Malawi Office and Malawi Government, represented by the MOH to undertake a 4-year Project called "Strengthening Physical Assets Management Programme" in the Republic of Malawi (hereinafter referred to as "Malawi"). The Project supports the MOH Physical Assets Management (PAM) Division under the Department of Health Technical Support Services (HTSS) to build its capacity to manage and maintain health physical assets across the country, both public facilities and CHAM hospitals.

The Project officially started in July 2006 with the arrival of Japanese Coordinator and a third country consultant. The first order of the day was to carry out training needs assessment and

analysis for maintenance and management of health physical assets in the health sector and to scan the environment in and outside Malawi that could provide capacity building training courses (short and long term) for the PAM Division and other MOH and non-MOH people who can have impact to achieving the Project objectives. Other donor agencies and NGOs assisting PAM Division and medical equipment suppliers were also considered as possible collaborators in the capacity-building process. After reasonable consultations with key stakeholders through visitation and a series of workshops, the framework for capacity building plan was put together in the so-called ***training plan*** for PAM. It took a little over a year to finish this lengthy but necessary process. In July 2007, the Project started implementing this training plan.

Worth mentioning is the mothballed Private Maintenance Contracting (PMC)[2] project supported by GTZ/KfW during the Project period (2008-2009). Depending on which side of the fence you are sitting, the pros and cons of this Project has stirred controversies not only in the MOH circle but also up to the political powers-that-be and the diplomatic community. As the controversial project somehow was running counter to the overall goal of the JICA PAM Project which is strengthening the capacity of PAM staff, it stalled and derailed for sometime the rather smooth sailing implementation of the training plan as the Project opted for a wait-and-see attitude in the light of the controversies brought about by the PMC project.
Eventually sometime in early 2009 the Malawi Government made its position clear and deferred the PMC project for the time being. With the air already clear, and the result of the mid-term evaluation out (October 2008), the Project speeded-up the implementation of the revised training plan for the rest of the Project life (June 2010).

[2] Reference No. 2.

### 2.2 Outline of the JIAC PAM Project

The main body of the revised/modified matrix is reflected in the narrative summary statements as shown below:

(1) The Project overall goal is "Medical equipment is appropriately and effectively maintained at health facilities (both MOH and CHAM)"
(2) The Project purpose is "Functional capacity of Physical Assets Management is strengthened"

**The outputs are;**

- *"Management capacity of PAM related staff for planning, procuring, and monitoring of medical and healthcare equipment is improved"*
- *"Skills and knowledge of Referral Maintenance Units (RMUs) in technological maintenance, monitoring and supervisions are improved"*
- *"Skills and knowledge of technical staff at district level in maintenance are improved"*
- *"Skills and knowledge of users of medical and healthcare equipment are improved"*

The ***Project overall goal*** is an ideal situation desired for the MOH Malawi. It only means that many contributing factors are needed in order to achieve this overall goal and the Project is just one of those contributors to these many factors.

One of these factors is stated as specific purpose of the Project, leading towards achieving the overall goal, that is to strengthen the functional capacity of PAM Division of the MOH through capacity building activities. The target groups and areas of concerns are stated in the outputs; that is (1) improvement in management capacity for planning and

Table 1 Project Expenditures (unit: Malawi Kwacha)

| Source | FY 06/07 | % of Total | FY 07/08 | % of Total | FY 08/09 | % of Total | FY 09/10 | % of Total |
|---|---|---|---|---|---|---|---|---|
| Project | 6,500,000 | 100.00 | 13,864,000 | 71.97 | 12,643,000 | 67.00 | 17,268,000 | 42.84 |
| MOH HQs | 0 | 0.00 | 3,950,000 | 20.50 | 2,200,000 | 11.65 | 18,206,000 | 45.17 |
| DHO/CH | 0 | 0.00 | 450,000 | 7.53 | 3,970,000 | 21.00 | 4,7854000 | 11.86 |
| CHAM | 0 | 0.00 | 0 | 0.00 | 59,000 | 0.35 | 48,000 | 0.12 |
| **Total** | **6,500,000** | **100.00** | **19,264,000** | **100.00** | **18,872,000** | **100.00** | **40,306,000** | **100.00** |

Remark: MK1.00 = 0.80 Japanese Yen)
Source: PAM Project Office, April 2010

procurement and monitoring of medical equipment by PAM Division itself, the PAM related staff in MOH HQs and the decision makers at the hospital levels; (2) the improvement of technological and management skills for maintenance of two groups of maintenance staff; the RMUs and CHMU (Central Hospital Maintenance Unit) / DHMU (District Hospital Maintenance Unit) staff. As well, (3) the development and enhancement of knowledge and operational skills of medical equipment users in all health facilities. Equipment user refers to the Medical Doctors, Clinical Officers, Medical Assistants, Nurses and Midwives, the Hospital and Patients Attendants and other cadres and the maintenance people and other artisans.

Based on the narrative summary of the matrix, activities and numerical targets, the so-called indicators for the Projects are set. Since it is a 4-year Project, these activities and targets are broken down on per year basis and reflected in the Annual Plan of Operation (APO) with corresponding aggregated Project and MOH counterpart budget plan.

The allocated annual budget from both parties is one of the limiting factors for the accomplishment of the APO. The other factor is the lack of qualified technical manpower (in terms of quantity) in the MOH organization, specifically in the PAM Division itself, the RMUs, and the maintenance units at the hospital level itself.

### 2.3 Outline of the Project Activities

From the Table, there are basically 4 main sources of funds namely, the Project itself, the MOH HQs counterpart budget and the District Health Offices (DHO) and Central Hospitals (CH) and CHAM hospitals counter part funds for Equipment User Training.

Clearly, the trend of Project fund contribution is going up though in terms percentage relative to the total expenditures the trend is decreasing, while the counterpart expenditures of the partner is increasing and so the percentage relative to the total expenditures. This is the desired trend for the technical cooperation project, however, not ideal as the Project chipped in almost 43% of the total expenditures even in its last year.

The DHOs and CHs had spent a good amount of money for Equipment User Training and it peaked to 21% of the total expenditures during the fiscal year 2008-2009. As explained early on the Project slowed down in some areas of its activities during this period of uncertainty and controversies brought about by the Private

Maintenance Contracting (PMC) project being introduced into the health system. During this time, the Project focused and embarked on country-wide cost-sharing scheme Equipment User Training Programme in District Hospitals and Central Hospitals. It brought good results as these hospitals responded positively and appreciated the training programme as a means to reduce unnecessary equipment breakdowns.

Noticeable as well is the lower than expected MOH HQs contribution in the same period at 11.65% of the total expenditures. The disbursement of counterpart funds from the main partner was so affected as well by the issue of PMC. After this issue was resolved, the counterpart funds rose to 45.17% of the total MK 40.3 M expenditure in the last year of the Project time. The total expenditures in the FY 2009-2010 is more than 150% of the total annual expenditures in the last two fiscal years.

## CHAPTER 3: STRUCTURE OF MEDICAL EQUIPMENT MAINTENANCE

### 3.1 The PAM Organisation

Organizational structure of the Medical Equipment PAM can be viewed as ideal. It has representation in the MOH HQs, there is the 4 Regional Maintenance Workshops called RMUs, and the service level workshops in the central hospitals and the district hospitals. The set up is much like that of the hospital referral system in placed in Malawi.

The RMUs Workshops are adequately equipped and their staff though were given reasonable training for the job, are inadequate in number (12 warm bodies). Several posts remain vacant up to this date. However, 15 new recruits are expected to join the organisation within the year and several promotions of the incumbents are in placed. The RMU caters basically for the medical equipment and other domestics (non-medical) like laundry equipment.

Majority of the service level maintenance units (CHMU/DHMU) are basically well organized in terms of staff, facilities, and are reasonably equipped. They are either supervised and headed by a Senior Maintenance Supervisor (SMS) or a Maintenance Technician (MT) and are under the wings of the hospital administrator (PHSA; Provincial Hospital Services Authority). The unit is catering and concerns mostly of non-medical equipment, e.g., mechanical and electrical plants, utilities and air-conditioning and heating equipment, solar power systems, transport and communication systems. Though most of the units are adequately staffed, their skill levels are still below the desired expectations to address local maintenance needs and demands.

### 3.2 Performance Availability of Healthcare Technology in Malawi Context

Evidence suggests that "performance availability" and stock of medical equipment in any health facilities is directly related to the quality of health care that facility can deliver whether that facility is in a developed or developing one. In a straight forward sense, poor performance of the existing equipment or the lack of equipment is generally accepted as contributor to the health crisis especially in the developing countries.

As a consequence, these countries do either 1 of the 2 or both; (1) allocate and spend huge amount of foreign currency to stock medical equipment which are being produced and manufactured widely by 3 countries; USA, Germany, and Japan, and struggled to ensure that the same are use optimally in their health facilities through maintenance and, (2) In most developing countries, foreign donors are tapped in to provide immediate re-stocking

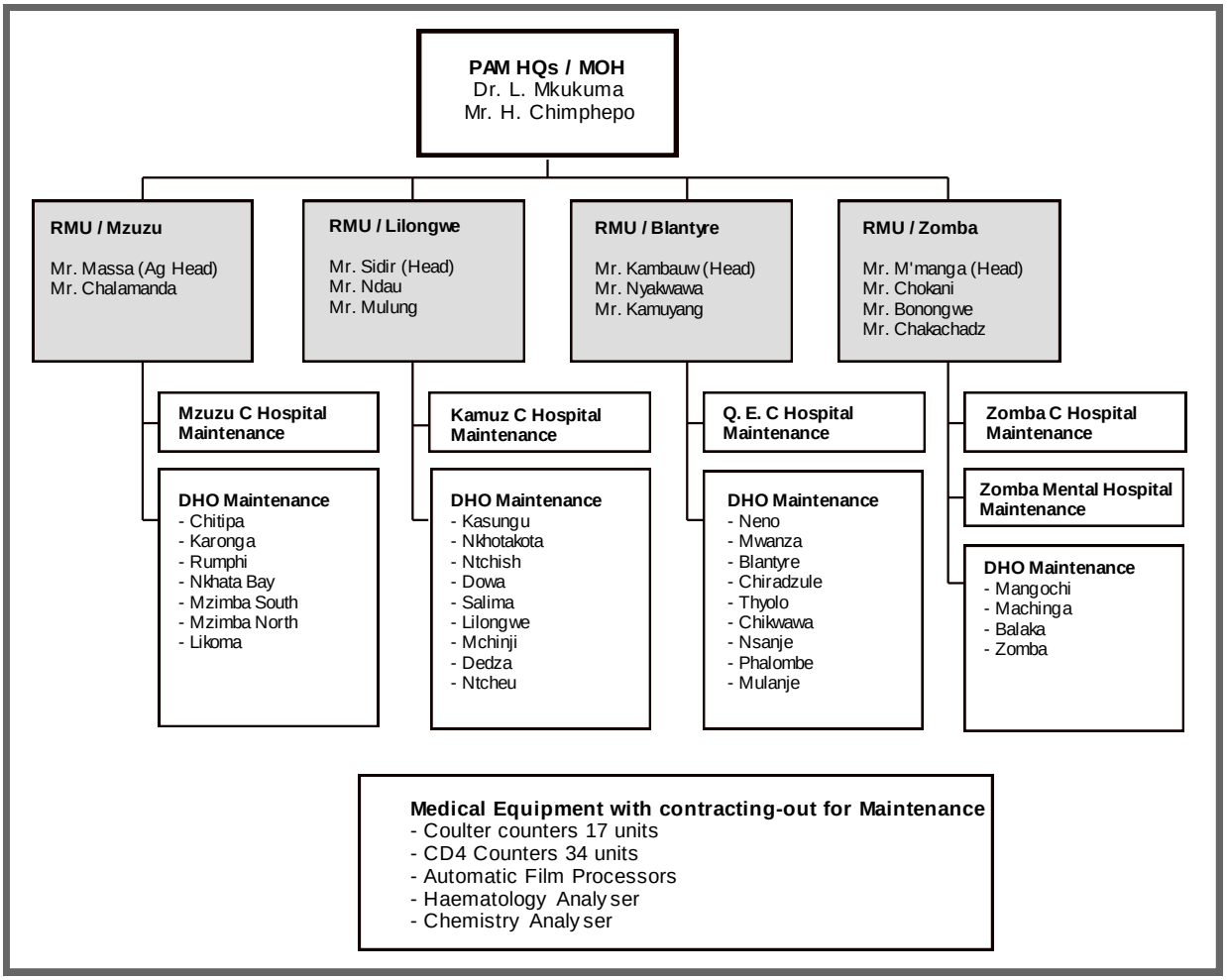


Fig. 1 Organogram of Maintenance of Healthcare Equipment in Malawi

(re-equipping) of medical equipment to addressthe problem of availability performance andsupport on short term capacity building for technical services (maintenance) and operation of the equipment.

Currently, there is no estimate close to accurate figure as to what proportion of equipment in Malawi, even in public health facilities only, that is not working due to the breakdown in reporting system and the non-functioning PLAMAHS software. However, it can be safe to say that there is a **need** to improve the operational performance of medical equipment in the public sector health facilities.

The reasons for the below acceptable performance availability of medical equipment in Malawi and like in any other developing countries, are multiple and complex. But generally, experts in the field of medical equipment management attribute the problem in developing countries to poor management of health care technology.

With regard to the public health sector, McKie (1989:19) states that "mismanagement of equipment starts in the health ministries and

spreads through the offices of regional health authorities, hospital boards and hospital directors"[3]. However, this report will focus its concerns on the technical service system in Malawi public health sector.

Generally, in a many countries, including Africa, there exists a private or commercial sector supplying equipment support services to the public health sector. These can be broadly classified as (1) suppliers of medical equipment manufactured by countries mentioned early on, and (2) supplier of equipment services. Most of the equipment suppliers and distributors combine supply / sales and servicing though. It is a generally accepted fact that specialised equipment are effectively serviced by commercial / private service provider or its distributor, although not in all cases. Example of this is shown in the Organogram of PAM.

### 3.3 Manpower Resources Issues (Quantity and Quality)

As mentioned, poor after sales service tract record of the very few local distributors or agents of medical equipment in Malawi contributes to low availability performance of medical equipment in public health facilities. The reason being is that the suppliers themselves are having difficulty getting qualified technicians and engineers for repair and maintenance of their stock of equipment. Even installation and commissioning of newly purchased equipment are inordinately delayed because of lack of technical manpower to do the same. Usually, it calls on its head office in South Africa or elsewhere for the installation and commissioning job of its equipment sold including in part training of intended users.

They do not have organic technical staff based in Malawi for this supposedly standard requisite for sales and marketing operation. They simply do not have enough capacity to provide the technical services expected of them.

It was pointed out early on that lack of qualified manpower in the health sector is endemic in Malawi. It is a big challenge therefore for Malawi MOH and PAM Division in addressing this challenge. But how many technical staff are actually needed by the system to adequately and efficiently address the demands for maintenance and management of health physical assets in Malawi is something to think and analyze.

There is no hard and fast rule as to the precise number of technical maintenance staff for medical equipment. However, experts suggest that it should be based on the number of health facilities and on stock medical equipment in use as well as the degree of sophistication of those stock equipment. In general though, there should be complementation between the PAM technical staff and the private service providers, however, as pointed out, this does not exist due to inherent problem of lack of technical manpower available in the market.

Under this situation the onus now lies squarely on the shoulder of PAM Division and the MOH in general. Addressing this challenge requires an in-depth analysis of the long and short-term objectives of the MOH with due consideration to its socio-economic implications, the health of the population and the key stakeholders including the donor community.

### 3.4 Spare Parts Availability and Inventory and Management Information System (PLAMAHS)

Malawi like many other African countries rely on donors to equip their health facilities. Because of loose control and poor enforcement of policies and regulations in accepting medical equipment donations, in many instances these countries become dumping site of

[3] Reference No. 3.

hand-me-down equipment. The supposedly good intention on the part of the donors turned out to be a burden to the recipient country because the donations even brand new are not the real need of that country but the wishes of the so-called consultants of the recipient hospital or Ministry who has the propensity to use high-end and state-of-the-art equipment to bolster their image. Usually many of these consultants do not stay for long in the hospital and after they have gone for one reason or another, nobody left in the hospital who is capable to use these equipment. As a result they deteriorated rapidly and unnecessarily ahead of their useful lifespan. When this happened, repair and maintenance work is compromised and could not be done not only because of its sophistication and that nobody was trained to repair it but replacement parts could not be sourced out as well.

In the same vein, many donor countries carry different brands and models of equipment, thus it is extremely difficult and prohibitive for the local technical organisation to carry and maintain reasonable amount of inventory in the system, thus, the repair and maintenance work is compromised.

This also happen in local procurement. Equipment procurement done by the Ministry, though done in consultations with technical staff of PAM suffers the same fate because of poor information exchange between the users and the maintenance people as to which equipment brands/model among the many in the market, base on their valuable experience and input to the procurement people, is appropriate and suitable for Malawi. As a result, the price of the equipment becomes a dictating criteria in the selection of tenders. In time, a number of brands and models of equipment become part of the system. As many brands/models are in the system, maintenance and repair work become more difficult, not only it requires technical and user training for each brand/model, as well, there is a need carry different spare parts for inventory.

For the past several years, PAM, specifically the RMU, is operating without spare parts inventory. Not only its performance level has inevitably gone down, equipment are left un-repaired or repair work took longer time but more seriously, quality of hospital service delivery is compromised and the morale of technicians and engineers went down with it as they could not experience the sense of fulfilment in their work.

The very few private health technical support service providers on the other hand, do not carry inventory of spare parts even for the brand and model of equipment they promote. Essential parts, whether major or fast – moving ones are brought into the country as needed, usually coming from South Africa or direct from the manufacturer of the equipment in Europe, America, Japan or Singapore. There should be a tracking system to manage huge quantity of spare parts inventory required by the system. An information system for health care equipment management is therefore imperative.

Information system is widely recognised among professional maintenance practitioners as an effective tool for better management of health care equipment. PLAMAHS or planning and management of assets in health services is one software programme capable of storing and accessing a whole range of equipment–related technical information like operation, maintenance instructions, replacement parts, manufacturer information, comprehensive equipment inventory, information on job history, etc. Without these information system in place, it will be very difficult to manage the maintenance of numerous medical equipment much so with the lack of standardisation of

medical equipment.

In 2004, with the assistance from EU and GTZ, PLAMAHS was introduced in PAM and installed in the RMUs and CHAM PAM. RMU staff as well as CHAM PAM staff were trained to operate and maintain the system. Initially thereafter, PLAMAHS was working well. However, the operation of the system could not be sustained for long for various reasons. Currently, PLAMAHS in RMUs is not utilise maximally. Invariably, this contributed to the management hiccups of medical equipment by PAM.

## CHAPTER 4: OUTLINE OF THE PMC CONCEPT

### 4.1 Concept of the PMC

The followings are basic outline of the PMC concept.

Based on the submitted proposal by the project proponent, the PMC will take over some of the major functions and responsibilities of PAM/RMU.

These are Planned Preventive Maintenance (PPM), Corrective Maintenance (CM), and user training. On top of that, the PMC will virtually take over the operation of RMU, with the option to absorb into its organization some staff of RMU willing and able to meet the criteria of the PMC. That means, the building and facilities, including all the equipment in the RMU facilities will be utilized by the PMC. However, the Heads of RMUs will be designated as monitors who shall act as the control and safety valve for the MOH PAM. They shall be stationed in the MOH HQs. Running cost of the operation of RMUs shall be borne by the PMC.

The basic concept of PMC is maintenance service -for-fee. The basic services provided by the PMC, e.g., PPM and CM to the hospital shall be paid by the MOH against receipt of performance which is monitored by PAM. The schedule of fees for each type of services and equipment is submitted before hand during the tender process.

The source of fund to pay the PMC is the money allocated by the German Government through KfW for Malawi MOH to finance the scheme approximately 6M EURO spread out for 4 years, with the option for extension up to another 5 years. On some situation, the PMC may as well, contract out maintenance of high-end equipment to the equipment suppliers.

The good thing about the PMC is that the issues of spare parts, tools and test equipment, safety and operational budget for PPM and CM will be handled squarely by the PMC and not anymore the headache of the MOH. The government may even impose to PMC equipment replacement or substitution to avoid discontinuity of hospital service due to equipment breakdown. Evaluation of their performance shall be the responsibility of MOH PAM monitors who can impose severe penalty and sanction for failure of PMC to live up to its expectations and the letter of the contract. It can even severe the contract on the spot, and demand heavy fine.

As this is a stop-gap measure, it should have a clear exit plan sometime in the future if and when the Government has built its capacity to perform the job of PMC. PMC and Malawi Government should determine the time frame of handing-over back in part of fully the functions and responsibilities to the unit responsible for the management and maintenance of medical equipment if that is the plan of Malawi Government.

Table 2　Relation MOH Infrastructures and the PMC Concept

| ITEMS | SCOPES |
|---|---|
| Duration of Contract | The HEMC concluded between the PAM Division and the PMC ***will be for four years***. ***However, the Contract will provide the options for an extension of the contract of additional 4 to 5 years, which is subject to a midterm review by KfW after two years of the Programme***.<br>(*HEMC: Hospital Equipment Maintenance Contract) |
| Equipment to be included in the HEMC | The attached equipment status list (see CHAPTER E.8) will provide an orientation about the equipment categories to be included in the Service Contract. The short-listed bidders will receive an updated and detailed equipment list out of the PLAMAHS system. |
| Facilities to be included | The Hospital Equipment Maintenance Contract (HEMC) will cover hospital facilities of the ***MOH (46 facilities) and CHAM (41 facilities)***. |
| Utilisation of PLAMAHS | The PMC has to fully utilise the existing data system for Planning and Management of Assets in the Health Services (PLAMAHS). This data system was implemented 2004 and updated since. The comprehensive programme combines modules for inventory taking, equipment status, definition of standard assets, sets and kits with specifications and financial data, definition of module facilities for various levels of care, generation of bills of quantities, calculation of budgets for new investments and recurrent costs. The present updated version is enhanced with modules for equipment maintenance and maintenance records, spare parts and facility planning in combination with invoice printing. Also tools for management of documents and addresses have been added. The powerful system can also be used for planning, implementation, documentation of maintenance activities.<br><br>The PMC will be responsible for operating PLAMAHS and therefore needs for utilizing at least one permanent assigned programmer and data encoder as well as one coordinator for data collection and updating. ***A first training and awareness workshops for technical as well as administrative PMC personnel, including a special training in the PLAMAHS data system will be provided by the consultant during the mobilisation phase of the PMC.*** |
| Utilisation of RMUs | ***The 3 plus 1 satellite Referral Maintenance Units (RMUs) in the North (Muzuzu), in Central (Lilongwe), in the South (Blantyre) and the Satellite RMU in Zomba are partly equipped and can be used free of charge by the PMC. The management and responsibility of all RMU's will be under the PMC.*** During the orientation phase the selected PMC has the obligation to check and evaluate each RMU service workshop related to their inventory and functionality. The PMC will be responsible for the up keeping of the RMUs and will have to pay for the utilities and other operational cost. |

Remark: The content by the bold words shows strong concerns with the JICA PAM Project.
Source: Final Pre-Qualification Document, January 2007, MOH Malawi and KfW

Table 3　Responsibilities of the PMC (1/2)

| ITEMS | SCOPES |
|---|---|
| Corrective Maintenance Services | To provide prompt onsite response to repair requests and optimise turn-around time of faulty or malfunction equipment. Personnel responding to service repair or emergency requests should be sufficiently competent to resolve the problem or at least identify or isolate the problem. In case of emergency repair calls the PMC should provide onsite response within an agreed time frame. The responds time may differ between the Central Hospitals and District Hospitals and may cover certain equipment categories only. |
| Maintaining adequate stock of spare part | The PMC in collaboration with the PPMU (PAM Project Management Unit) will identify an appropriate spare parts list that should be stocked to maximize equipment uptime. The PMC shall ensure critical parts are adequately stocked at the PMC central store and at the RMUs. The spare part list must be reviewed every 6 months so that the optimal level will be reached within 2 years. The PMC may at its discretion purchase spare parts that are valued at per item < MK10,000 not exceeding a total of MK 250,000. For spare parts valued ≥ MK10,000 prior approval would be required from the PPMU. |
| Calibration and testing | Upon taking over the services, the PMC will be provided with basic test and calibration instruments. The PMC shall ensure that relevant medical equipment is calibrated as part of the HEMC and the equipment shall be calibrated by competent personnel. Should, additional tests and calibration instruments, beside the initially provision, be needed the cost of investment will be born by the PMC. |
| External service contracts | For highly specialised medical equipment, the PMC may sub-contract out maintenance service via long term or single services contract to external service companies or manufacturers. The PMC is required to prepare and submit a list of equipment that would be sub-contracted out for maintenance to the PPMU for approval. Such services may include preventive maintenances, repairs and spare parts. |
| User and technical training | ***The PMC shall collaborate with the PPMU to identify and prepare annual training programmes for hospital end-users and carry out these training programmes. Some of these user training shall be done during PPM. User training should be focused on user's maintenance and safety measures to enable users to be active participant in the overall equipment maintenance programme. The training programmes should be reviewed every 6 months to ensure its effectiveness.***<br><br>***The PMC shall also conduct regularly internal staff training to ensure that they have acquired sufficient skills and knowledge to provide the services.*** |

Remark: The content by the bold words shows strong concerns with the JICA PAM Project.
Source: Final Pre-Qualification Document, January 2007, MOH Malawi and KfW

Table 3　Responsibilities of the PMC (2/2)

| ITEMS | SCOPES |
|---|---|
| Monitoring of acceptance and warranty of newly supplied equipment | The PMC shall monitor the process of handing over of newly acquired equipments to ensure that the equipment performs as specified in purchase documents/ manufacturer's specifications and is meeting all relevant safety standards as well as is updated in the PLAMAHS system. The PMC will monitor the execution of warranty services. A report of the status of newly acquired equipment would be submitted to the PPMU every 6 months. This report should include information related to warranty and pending expiry of warranty. |
| Managing PLAMAHS | The PMC will to take over the asset management system "Planning and Management of Assets in the Healthcare Services" (PLAMAHS) and ensures that inventory of assets and maintenance records are regularly updated. The PMC shall keep good records of all maintenance works carried out in the PLAMAHS system. The PMC shall complete updating inventory of assets and records of maintenance work done within 6 months after taking over of the services. |
| Disposal of Condemned Equipment | The PMC shall appropriately tag all equipment that has obtained approval to be condemned and shall provide assistance in the removal of condemned medical equipment to appropriate storage sites. The condemned status of the equipment must be updated in the PLAMAHS system. |
| Handling of Hazardous material and Contaminated Equipment | The PMC shall ensure that hazardous material and contaminated equipment is properly stored at the facilities and personnel is trained for proper handling of such material (mercury, radioactive sources and equipment contaminated with body fluid). |
| Technical Library | Technical manuals are essential reference for maintenance personnel to gain knowledge on the operation and maintenance of medical equipment. The PMC will establish and maintain a technical library covering technical manual and service documentation. |
| Technical Advice to PAM and Hospital | Provide regular technical advice to the hospitals and to the Physical Asset Management (PAM) Division of the MOH on inventory count status, operational and maintenance status of equipment as well as highlighting any repeat and/or prolong equipment failure. Any incident that could compromise the quality of clinical services delivery, safety of personnel or the facility shall be reported. |
| Continuous Improvement Initiatives | The PMC will establish mechanisms to avoid failure or breakdown during diagnosis or therapy procedures. This will involve regular review of maintenance records, work processes, procedures and keeping updates of equipment health alerts issued by manufacturers. The PMC will take prompt actions to implement recommended corrective actions where applicable. |
| Quality Assurance Programme (QAP) | The PMC will implement Quality Assurance Programme (QAP) to measure maintenance services performances and thus provide a mechanism for continuous improvement of the services. Through such initiatives the PMC should work towards achieving ISO 9001:2000 certification within 4 years after taking over the maintenance services. |

Source: Final Pre-Qualification Document, January 2007, MOH Malawi and KfW

### 4.2 Responsibilities of the PMA which considered by the German Government and the MOH

Followings are the outline of the PMC conceptwhich were shown in the Pre-qualification of the Tender concerning the selection of the PMC.

## CHAPTER 5: HARMONIZATION OF CAPACITY BUILDING AND PMC

### 5.1 Implication on JICA PAM Project and PMC

Improve "performance availability" of medical equipment in the health sector is the ultimate goal of many a Government Ministry of Health, especially in Africa. Performance availability simply means that adequate number of medical equipment is functional, safe, with appropriately trained operator and /or available on stock, ready for use anytime.

On the other hand, the buzzword "Capacity Building" is a broad term and means differently to different people. To build capacity for management and maintenance of medical equipment would therefore require a number of interventions. One of these interventions is skills development through training of equipment users and maintenance staff, maintenance and health facility managers and other key staff. These 3 broad categories of human resources would require different approaches and training programmes relative to medical equipment management and maintenance. Other areas that need interventions are spare parts availability, appropriate tools and test equipment, infrastructure, adequate financial resource for operation, infrastructure, monitoring and evaluation, etc.

JICA PAM Project in Malawi can effectively address one of these interventions; training of human resources for maintenance of medical equipment. Therefore, availability of trainable human resource in the system is a requisite for this kind of exercise. Regular human minds can only absorb so much information and ordinary human beings can only be trained up to a certain level. Skills development trainings given to a limited number of people will not address effectively the challenges of medical equipment maintenance. Without adequate number of human resource for maintenance who can be trained and developed, any training programme designed to increase capacity will not create an impact in the maintenance of medical equipment. Further, training of human resources is a continuing and a long-term process. Its tangible effects and outcomes can only be measured by the change in the performance availability of equipment which does not happen over a short span of time of because of many contributing factors as mentioned early on. It will take a while before things will improve from its present situation.

On the other hand, the PMC concept if designed to be a stop-gap measure to address the present and short-term needs of the system like spare parts, tools and test equipment, equipment preservation and restoration, etc., just to keep the public health sector health facilities in firm footing and running.

But how will the two concepts can co-exist? What would be the ideal modality?
There is no formula to answer these questions. The answer may be found in the ultimate goal why there is a need to manage and maintain health care equipment. The two concepts should be able to complement each other for the common goal, to achieve a common objective, that is to improve the "performance availability" of medical equipment and contribute to the improvement of health care delivery system.

The two can co-operate, JICA PAM, in case of

Malawi context shall be in charged of the long–term process of skills development training of the 3 general groups of human resources in health, equipment users, maintenance technicians and engineers, and the maintenance managers and health facility managers, including procurement people.

On the other hand, the PMC would be focusing on the short-term main goal, which is restoration and preservation of medical equipment. Eventually PMC should be weaning out of this tasks when the system can fully manage and maintain the medical equipment.

What would be the time line? The answer lies on how fast the MOH can recruit trainable maintenance staff to replace the PMC gradually and how good the JICA PAM an develop their skills. As mentioned, training is a continuing process, therefore, inherent in this capacity building training is for the system to carry on the training programme started by the Project.

### 5.2 The Way Forward of Medical Equipment Maintenance in collaboration with Capacity Building and PMC

The business of medical equipment in Malawi or generally, the market base of medical equipment is still in its infant stage and lacks the attraction and incentives for big suppliers to establish their base in Malawi. Therefore, private sector involvement in the maintenance of medical equipment is inherently weak and a risky business proposition. The view of the Malawi Government to the proposal therefore is similar to privatization or PPP (private-public partnership) scheme. The Government believes that this scheme would be detrimental to its long-term goal of building capacity for Malawi to manage and maintain public health physical assets. In well-developed countries, e.g., Japan, USA, Europe, where market base is large and competition is assured, private sector involvement in maintenance of medical equipment is a viable proposition, however, for a developing countries, like Malawi, this scheme poses too much risks and uncertainties.

In another front, Medical Equipment Center (MEC) being created and established in big health facilities since year 2000 in the developed countries, especially in Japan. In a nutshell, the MEC is envisioned to address the challenges in medical equipment management and maintenance in the public health sector. As well, the MEC will lend out, repair and maintain, check and calibrate medical equipment in those health facilities. In addition, job sub-contracting with the private sector has been introduced as one of the functions of the MEC, in case of the complex and sophisticated equipment. Further, it shall coordinate all the issues of medical equipment procurement with the suppliers, including installation and commissioning, warranty execution, training of users, boarding off, etc. The Government bears the responsibility to decide which option to take; whether to utilize the private sectors, or strengthen the public sector run maintenance organization. The private sector though, is generally considered as more reliable, effective and efficient in the long run to take care of the maintenance concern of the public health sector, however, there are exemptions to this general rule. Depending on the national circumstances, there is an inherent advantage for the public health sector to have an organic specialized unit dedicated for medical equipment maintenance and management. It is the duty of the Government to weigh the pros and cons of the various options available. However, in many a countries the optimum combination of these options is almost always the practical and viable option to address the challenges of medical equipment maintenance and management in their countries.

Depending on many variables, looking at any angles, MEC can only benefit from the collaboration of capacity building project and PMC if properly managed.

The way forward is for the MEC to do the following:

(1) Identify priority strength and weaknesses *vis-à-vis* its long-term and short-term goals
(2) Determine if those prioritized weaknesses fall within the framework of capacity building project and PMC, if not request them to re-align their objectives to address your weaknesses.
(3) Build on the strength identified, request the project proponents to assist MEC in this objective, bearing in mind that project has a life span.
(4) Draw up/design Project Design Matrix (PDM) and implementation plan and benchmarks for Monitoring and Evaluation
(5) Always maintain an attitude of WIN-WIN solution to the challenges. The MEC has its interests and objectives, likewise PMC and capacity building project have their own interests and objectives. The challenge is for the MEC to satisfy all theses interests and objectives, without compromising on the long-term benefit and goal; Improved Performance Availability of medical equipment.

**Acknowledgement**

In participating this paper, we received extensive invaluable advice and information from Dr. Lovemore Mkukuma, Head of PAM of the Ministry of Health of Malawi, technical staff members of the RMUs in Malawi, and JICA Malawi Office Project concerned staff members. We would like to express our sincere appreciation for their cooperation and assistance.

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