Malawi

The Microwave Network Improvement Project

Report Date: July, 2002
Field Survey: August, 2001

1. Project Profile and Japan's ODA Loan

Project Site (whole country)

Microwave Tower

Microwave Digital Exchanger

1.1. Background

Malawi had suffered from economic recession since the late 1970s and gone through structural adjustment programs. By the mid-1980s, the economy showed signs of recovery; however, there was a substantive financial deficit in public investment programs. For Malawi to achieve sustainable economic development, it was deemed vital to support the telecommunication sector through the installation of a microwave telecommunications system across various regions. In the mid-1980s, telephone density in Malawi was among the lowest in Africa –0.56 telephone sets or 0.27 telephone lines per 100 inhabitants[1] in 1985 – and telephone demand was expanding rapidly. The existing system was outdated and had deteriorated. Most exchanges used outdated magnet, crossbar or step-by-step systems, and there was only one digital exchange system in Blantyre, the commercial center of the country.

[1] ITU Statistical Yearbook

1.2. Objectives

To increase the capacity and reliability of main trunk microwave transmission links in Malawi's telecommunications system in order to meet expanding demand.

1.3. Project Scope

The project consists of the construction of microwave transmission links (microwave digital exchangers, antenna towers, batteries and other equipment) for the following sections: (1) Blantyre-Lilongwe (250 km, 6 stations, 2 systems, 140 mbps and 1,200 channels), (2) Liongwe – Mzusu (290 km, 6 stations, 2 systems, 140 mbps and 660 channels) and (3) Blantyre – Zomba – Salima (340 km, 10 stations, 2 systems, 140 mbps and 990 channels for Blantyre-Lilongwe, 390 channels for Blantyre-Zomba, and 240 channels for Salma-Lilongwe) and the provision of consulting services (77 m/m).

1.4. Borrower / Executing Agency

The Government of the Republic of Malawi / Department of Posts and Telecommunications (DPT) (which became Malawi Telecommunications, Ltd. in 2000 as a first step toward privatization under a World Bank assisted program (to be discussed in later sections))

1.5. Outline of Loan Agreement

Loan Amount	4,136 million yen
Loan Disbursed Amount	4,136 million yen
Exchange of Notes	June 1986
Loan Agreement	July 1986
Terms and Conditions	
Interest Rate	1.5 % p.a.
Repayment Period (Grace Period)	30 years (10 years)
Procurement	Partially Untied
Final Disbursement Date	July 1991

2. Results and Evaluation

2.1. Relevance

The project was consistent with the Government's telecommunications sector strategy and order of priority. As part of Malawi's structural adjustment program started in the 1980s, its public investment programs (PIP) had to be reviewed and screened by the World Bank and other international donors. This project was listed as a top priority in the PIP at the time of appraisal, together with other projects self-financed or financed by international donors. This implies that the Government and international donors recognized the project as a top- priority public investment program at the time of appraisal.

Since 2000, Malawi has been implementing the points made in a Poverty Reduction Strategy Paper (PRSP) as a fundamental macroeconomic guideline. The PRSP explicitly recognizes the importance of telecommunication networks as a sectoral priority. The Government plans to increase the number of telephone lines from the current 45,000 lines – or 0.43 lines per 100 people（2000）, which is still low despite improvements – to 150,000 lines by 2004, through the Privatization and Utility Reform Project[2], to be financed by the World Bank, DANIDA and international donors. Hence, the project objective of increasing the telephone capacity has been relevant and still is quite relevant to today's development priorities.

2.2. Efficiency

(2.2.1.) Project Scope

All construction work was implemented as planned, although there were modifications to the number and location of stations and inclusion of TV broadcasting system, as detailed below. These modifications were considered necessary for a more reliable and efficient telecommunications network.

The number and location of stations – At the detailed design stage, it was considered necessary to modify the project location and add some stations in order to ensure the quality of the microwave network.

Television broadcasting system – There was a Presidential decree encouraging the installation

[2] The World Bank (2000), *Malawi Privatization and Utility Reform Project* (Project Appraisal Document), available to the public.

of a television network in the country, which would require the installation of a broadcasting system in due course. It was considered efficient to install this system at microwave stations.

Also, three additional systems were constructed under the project. Originally, they were to be installed simultaneously with this project, using Malawi's own funds. However, due to delays in procurement, the government realized it could not finish installing these systems on schedule, and requested that they be included in the project as an additional scope. This addition ensured the proper functioning of the project as a whole.

Optical Fiber Cable system – It was found that the existing copper junction cable capacity between project sections was not enough to support the call circuits to be provided by the project. Hence, a new transmission system linking Lilongwe Microwave Stations with the Lilongwe South Telephone Exchange–Lilongwe Capital Exchange was required.

PCM system – The DPT (Department of Post and Telecommunications) planned to integrate the local transit and international switches at the Limbe station with the Blantyre switch station as part of its basic development scheme. However, the implementation of this plan was delayed. As the existing capacity between Blantyre and Limbe was insufficient, an additional 2 mbps PCM cable systems were installed between the two stations.

The installation of a digital radio concentrator system was also approved as an additional scope for the following reasons: (a) the installation of a radio system could satisfy increasing telecommunications demand in the project area (Salima & Mangochi, especially), where public facilities and industrial facilities are concentrated, and (b) it would allow an effective use of this project's microwave network facilities.

(2.2.2.) Implementation Schedule

The project started three months after the scheduled date in the original implementation plan. However, this delay was offset by a time savings in the design and construction period of one month. Actual installation was accelerated by increasing labor inputs. Final acceptance was delayed because of commercial power supply connection delays at the Ntcheu, Chioza, Dangaliro and Chikangawa repeater stations. This oversight was the responsibility of DPT. Remedial actions taken include: (a) reducing the manufacturing time by one month, and (b) increasing the level of manpower available for project implementation.

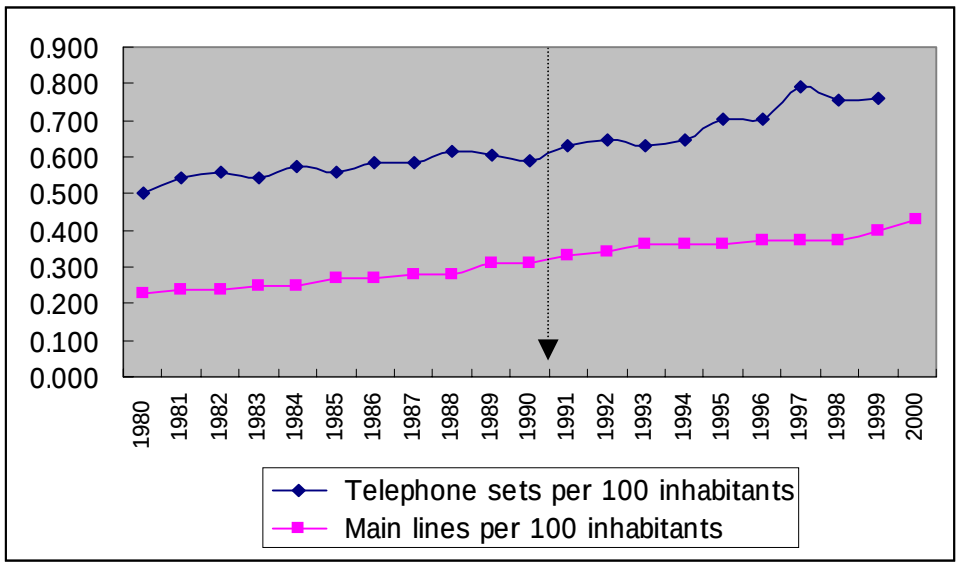
(2.2.3.) Project Cost

The above modifications were made within the contingency fund as stipulated in the Loan Agreement and there was no cost overrun for the ODA portion, although there was a slight cost overrun in the local currency portion.

2.3. Effectiveness

Improvement of telephone access: As shown in Figure 1, the number of telephone sets and telephone lines per 100 inhabitants has been increasing. As of 1985, there were 0.560 telephone sets and 0.270 lines for every 100 people in Malawi, and these figures rose to 0.592 and 0.310 in 1990—the year the project was completed -- 0.702 and 0.360 in 1995, and 0.763 and 0.400 in 1999. This increase is attributable to the improvement of the telecommunications network, through this project and other telecommunication projects[3] implemented over the past decades.

Figure 1 Telephone sets and lines (in operation) per 100 inhabitants



Source: ITU Statistical Yearbook

The trunk transmission links under the project cover the areas which utilizes the telephone network most: Lilongwe, the capital; Blantyre, the commercial center of the country; Mzusu, the main city in northern Malawi; and Zomba, the former capital and seat of the national congress.

[3] Other projects include Rural Automatization Project (French aid), Lilongwe-Chipata Microwave Link (self-financed), Telecoms II Project (African Development Bank), Blantyre Rehabilitation and Extension Project (Nordic Development Fund) and other self-financed or externally assisted smaller-scale improvement projects.

These links occupy a significant part of the telephone network in Malawi (trunk traffic volume occupied 80 to 90 % of total traffic volume at the time of appraisal), which suggests that the project has contributed substantially to improvements in the overall telephone network in Malawi, both quantitatively and qualitatively.

Table 1 Telephone access and service quality indicators in Malawi (before and after the Project)

		1980	1985	1990	1995	1999
Public pay phones		n.a.	n.a.	434	454	541
Telephone sets		31,023	40,578	50,180	65,664	77,300
Telephone sets per 100 inhabitants		0.502	0.560	0.592	0.702	0.763
Main telephone lines in operation		14,555	19,856	26,640	34,338	41,362
Main lines per 100 inhabitants		0.230	0.270	0.310	0.360	0.400
% of automatic main lines		92.72	92.00	93.00	98.00	98.00
% of digital main lines		n.a.	n.a.	29.00	54.00	65.00
% of residential main lines		41.10	n.a.	48.00	45.00	42.00
% of urban main lines		n.a.	n.a.	78.00	80.00	76.00
Connection capacity of local exchanges		20,848	30,560	40,649	65,854	70,904
International telephone circuits		n.a.	n.a.	158	233	365
Waiting list for main lines		1,534	3,379	11,016	24,886	31,554
Completion Rate	International (%)	n.a.	24*	28	32	40
	Long distance (%)	n.a.	n.a.	n.a.	n.a.	n.a.
	Local (%)	n.a.	n.a.	n.a.	n.a.	n.a.
Telephone Traffic	International	n.a.	2,120*	4,236	7,621	10,181
(See note)	Long distance	n.a.	2,707*	3,397	4,409	5,394
	Local	n.a.	907*	1,132	1,470	1,798

Source: MTL and ITU Statistical Yearbook
Note: Telephone traffic is expressed in thousands of minutes for international calls, and in thousands of pulses for domestic calls; *1986 figures

As indicated by the increase in the completion rate for international calls, from 24% in 1985 to 40% in 1999 (see Table 1), there was an increased reliability of international telephone connection. The completion of this project has made it possible to connect Malawi's telecommunication network with those in neighboring nations (Tanzania and Zambia),[4]

[4] The Malawi-Tanzania line was financed by a Norwegian grant and the Malawi-Zambia line was self-financed. The Malawi-Mozambique line was not realized due to political turmoil in the country.

constituting the Pan-African Telecommunication Network (PANAFTEL), which is an indication of the way this project has contributed to increasing the network's reliability. Although no data were available for the completion rate for the domestic calls, the same trend is anticipated.

Gap between increased capacity and actual operational lines: The connection capacity has increased from 30,560 lines in 1985 to 70,904 lines in 1999, however, the number of lines actually utilized is nearly 58.3% of connection capacity (or 41,362 lines). In other words, the number of telephone lines in operation increased in both absolute and relative (per population) terms after the project, but they are still substantively under-utilized. The increase in the number of telephone lines could not keep pace with increasing telephone demand. The number of people on the waiting list for a telephone line increased from 3,379 in 1985 to 31,554 in 1999.

These observations suggest that there was a gap between connection capacity and the number of lines in operation resulting from the delayed installation of individual connections by DPT. This problem was common among state-run telecommunication services in Sub-Saharan countries, which has provided a basis for utility sector privatization in these countries[5] under structural adjustment programs since the 1980s. Malawi was not exempted in this regard. DPT was incorporated into MTL (Malawi Telecommunications Ltd.) in 2000, as a first step towards privatization. However, it is still too early to gauge the effects of the incorporation and of future privatization of MTL.

TV Broadcasting: The installation of a TV broadcasting system enabled the creation of Malawi Broadcasting Corporation (MBC) TV, the only national TV station in the country, which has been in operation since the early 1990s.

Financial benefits: The project brought additional revenues to MTL. The re-calculated FIRR is 7.1%, while the figure estimated at the time of appraisal was 11.4%. The following assumptions were applied in re-calculating the FIRR:

Costs: Investment costs from this project and incremental operations and maintenance costs of the project (all expressed in 1986 constant prices)
Benefits: Incremental revenues from the project to MTL (in 1986 constant prices)
Project Life: 20 years
Data availability: Actual figures are available for only 1997-2000, while other figures are

[5] See, for example, World Bank (1994), *World Development Report – Infrastructure for Development* for rationale for utility sector privatization based on case studies.

estimates or forecasts.

This recalculated value may reflect relative inefficiency in revenue collection under DPT because of the under-utilization of actual telephone connection capacity as discussed above.

2.4. Impacts

Expansion of information technology (IT): The antennas installed under this project are being used for purposes that were not anticipated at the time of appraisal, namely IT services, such as cellular telephone services and Internet hosts. Table 2 summarizes the IT indicators in Malawi before and after the project. Currently, there are two mobile phone operators and 13 Internet service providers, all of which have benefited both directly and indirectly from the project.

Table 2 Expansion of IT services in Malawi

	1985	1995	1996	1997	1998	1999	2000
Cellular mobile telephone subscribers	0	382	3,700	7,000	10,500	22,500	49,000
Cellular subscribers per 100 inhabitants	0	0.004	0.030	0.070	0.100	0.220	0.470
Number of internet hosts	0	0	0	0	1	2	13
Estimated internet users	0	Nil	Nil	500	2,000	10,000	15,000

Source: ITU Statistical Yearbook

The expansion of telecommunications and new information technology significantly reduced transaction costs over long distances (between the two major cities, Blantyre and Lilongwe, for example), where lack of transportation infrastructure typically makes transaction costs prohibitively high. Reduced business transaction costs are expected to generate new investment opportunities.

In addition, the expansion of IT is likely to yield various other tangible benefits,[6] for example by helping inform, educate and empower the poor and by expanding their social and economic opportunities. Computerization of administration would increase the accuracy, reliability and transparency of public services.

Environmental impacts: There has been no negative environment impact reported for the project. There was no involuntary relocation or resettlement of local residents as the sites

[6] World Bank (1998), *World Development Report – Knowledge for Development*.

existed before the project.

2.5 Sustainability

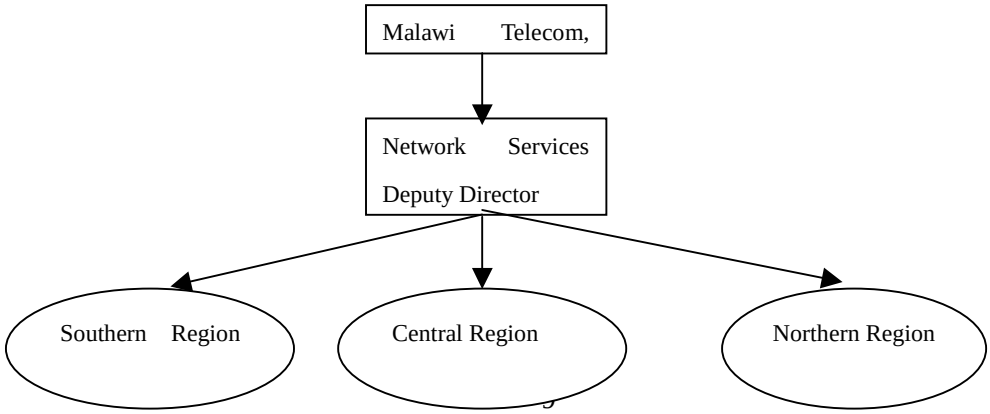
Institutional Reform of DPT: At the time of appraisal, the project was to be implemented and operated by the Department of Post and Telecommunications (DPT). In 2000, the Telecommunication Division, under the DPT, was incorporated into Malawi Telecommunications Ltd. (MTL), and the Postal Division was incorporated into Malawi Postal Corporation (MPC), a first step toward the privatization of MTL under the World Bank assisted Privatization and Utility Reform Project. The government keeps a regulatory framework under the newly established Malawi Communications Regulatory Authority (MACRA).

Operations and Maintenance (O&M): Currently there is a staff of about 800 full-time professionals working at MTL, including O&M staff working at sites around the country, although the number of professionals are expected to be laid off during the process of privatization in the next few years. Currently, the operation and maintenance section is responsible for the Transmission Network and is headed by the Deputy Director of Network Services, based at Engineering Headquarters in Blantyre. The Interconnection Business Unit Managers, one each for the Southern, Central and Northern Regions, are coordinating O&M duties on a daily basis.

All engineers are required to have a university level diploma in telecommunications, and newly hired professional staff must go through on-the-job training. In some cases, they are sent to training courses provided by suppliers.

At the station level, there is one local MTL officer on site and monitors the exchanger and other equipment. Engineers from regional headquarters visit these sites at least once a month and when major disruptions are reported by local officers.

Figure 2 O&M Organization at MTL



Present conditions of facilities and materials: Lack of spare-parts has been reported in major equipment procured under the project (including radio equipment, supervisory equipment, carrier multiplex equipment, power supply equipment, maintenance parts and maintenance vehicles), although it has not created any major obstacle to the operation of the telecommunications system as a whole. According to MTL, the maintenance section cannot procure the necessary spare-parts due to insufficient financial resources . This problem could be seen as a misallocation of resources. The on-going sector reform program aims to enhance MTL's managerial and financial efficiency. Currently, the World Bank, DANIDA, USAID and African Development Bank (AfDB)[7] are assisting the telecommunication sector in Malawi through institutional reforms and rehabilitation and investment projects, which are expected to improve the current situation.

Financial Situation: Tables 3 and 4 summarize MTL's Profit and Loss (P/L) Statements and Balance Sheets (B/S) for 1998, 1999 and 2000. Note that no B/S was reported for the years preceding the corporatization of DPT in 2000. After corporatization, MTL was required to report and audit all financial statements, including P/L and B/S.

Before corporatization in 2000, the Telecommunication Division of DPT was showing a net profit (before tax): 445 million kwacha in 1998 and 335 million kwacha in 1999. In 2000, net profit rose to 961 million kwacha. As the inflation rate in Malawi is high (45% from 1998 to 1999[8]), these figures should be taken with caution. The decline in net profit from 1998 to 1999 is thus more severe in real terms than in nominal terms and the rise of net profit from 1999 to 2000 must be less in real terms than in nominal terms, although there is some sign of recovery.

The Return On Assets (ROA), calculated from the 2000 B/S and P/L, is 20.1%. In the future, O&M, which is a growing area, will have to be self-financed. As MTL is currently 100% government owned and has limited control over regulatory policies, including tariff rates, it will have limited financial autonomy. There are several political and administrative obstacles to be overcome before MTL achieves full financial autonomy.

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[7] On-going or planned projects by other donors: Private Sector Development Projects I, II, III (World Bank), Privatization and Utility Reform Project (World Bank), Telecom Reform and Rehabilitation Project (DANIDA), Telecom Investment Project (AfDB), and Support to Privatization Commission (USAID).

[8] IMF, *International Financial Statistics (annual).*

Table 3 Profit and Loss (P/L) Account of MTL (in millions of kwacha)

	1998	1999	2000
Metered calls	748	1,258	1,559
International calls	90	151	188
Interest	1	1	2
Other revenues	28	47	59
Total income	**867**	**1,457**	**1,808**
Payroll	138	208	206
Services and supplies	134	605	374
Maintenance	65	191	126
Total Operating Expenditure	**337**	**1,004**	**706**
Profit before finance charges and depreciation	**530**	**453**	**1,102**
Depreciation	46	66	73
Profit after depreciation before finance charges	**484**	**387**	**1,029**
Interest	39	52	68
Net Profit Before Tax	**445**	**335**	**961**

Source: MTL at the end of fiscal year (March)

Note: Inflation Rates 1997-1998 30%, 1998-1999 45%,1999- 2000 n.a.

Table 4 Summary Balance Sheet (B/S) of MTL in 2000 (in millions of kwacha)

Current Assets	1,874	Current Liabilities	2,578
Fixed Assets	2,886	Fixed Liabilities	928
		Capital	1,254
Total Assets	**4,760**	**Total Liabilities +Capital**	**4,760**

Source: MTL as of December 2000

Note: Balance Sheet was not reported before the corporatization of MTL

Comparison of Original and Actual Scope

	Plan	Actual
(1) Project Scope		
A.Construction Work		
1.Blantyre-Lolongwe	250 km	254.3 km
(1) Number of stations	6 stations	7 stations
(2) Number of systems	2 systems	as planned
(3) Transfer rate	140 mps	as planned
(4) Actual capacity	1,200 ch	1,080 ch + 68 mpbs TV
2.Lilongwe – Mzusu	290 km	295.8 km
(1) Number of stations	6 stations	7 stations
(2)Number of systems	2 systems	as planned
(3)Transfer rate	140 mps	as planned
(4)Actual capacity	660 ch	960 ch + 68 mbps TV
3.Blantyre – Zomba – Salima	340 km	382.3 km
(1) Number of stations	10 stations	9 stations
(2) Number of systems	2 systems	as planed
(3) Transfer rate	140 mps	as planned
(4) Actual capacity		
Blantyre – Lilongwe	990 ch	1200 ch
Blantyre – Zomba	390 ch	480 ch + 68 mbps TV
Salima – Lilongwe	240 ch	480 ch
B.Consulting Service	77 m/m	80.5 m/m
C.Additional Scope		- 140 mbps OFC systems - 2 mbps cable PCM system - digital ratio concentrator system
(2) Implementation Schedule		
1. Employment of Consultant		
• Contract	June 1986	August 1986
2. Construction		
• Tender Float	Nov. 1986-Jan. 1987	June 1986-July 1987
• Tender Evaluation	Jan. 1987-Mar 1987	June 1986-July 1987
• Contract	May 1987	July 1987
• Design and Manufacturing	June 1987-Apr 1988	July 1987-March 1988
• Shipping and Inland Transportation	Sept 1987-June 1988	Dec 1987-Aug 1989
• Installation Work	Nov. 1987-Dec.1988	Dec 1987-Aug 1989
• Final Acceptance	Nov. 1989	Aug 1990
• Training	April 1988-June 1988	Jan 1988-March 1988
(3) Project Cost		
Foreign currency	4,136 million yen	4,136 million yen
Local currency	4,690 thousand MK	4,884 thousand MK
Total	4,713 million yen	4,398 million yen
ODA Loan Portion	4,136 million yen	4,136 million yen
Exchange Rate	1 Kwacha = 123yen	1 kwacha = 53.60 yen*

*weighted average during the disbursement