

## Yemen

### Aden Telephone Network System Expansion Project

Report date: March 2001

Field survey: August 2000

#### 1. Project Profile and Japan's ODA Loan



Site map: Aden, the Republic of Yemen



Installed switching machine

#### 1.1. Background

In 1988, telephone demand in Aden, the capital of the former South Yemen, totaled 39,000 lines, while the city had a switching capacity of 19,600 lines, indicating a significant shortage in telephone lines. The penetration ratio for telephones estimated on the basis of population statistics was approximately 5.5 lines per 100 inhabitants. Furthermore, the existing switching machines, procured from the 1950s to the '70s, were old step-by-step or crossbar type machines stored in containers, and had become obsolete.

After the unification of North and South Yemen in May 1990, Aden was positioned as the economic capital of the newly unified country. The concentration of industrial development in Aden was expected to give rise to a population influx, with a subsequent, inevitable increase in telephone demand. Improving and expanding communications facilities, therefore, had become an urgent task.

#### 1.2. Objectives

To modernize existing obsolete telephone switching machines and to install new and additional telephone switching machines, thereby meeting demand for communications in Aden in quantitative terms and improving communications systems in qualitative terms.

#### 1.3. Project Scope

The project comprised (1) newly installing (modernizing) digital switching machines for 49,200 lines in six telephone exchanges, (five existing machines and one newly built one) (2) installing new long-distance relay switching machines for a total of 800 lines, (3) introducing an optical fiber transmission system to connect the six exchanges

digitally, (4) installing additional primary cables following the increase in switching machine capacity, and (5) installing other related facilities. The ODA loan covered the foreign currency portion of the total project costs, including procurement of materials/equipment and installation work but excluding consulting services.

#### 1.4. Borrower/Executing Agency

The government of the Republic of Yemen/Public Telecommunications Corporation of Yemen (PTC)

#### 1.5. Outline of Loan Agreement

Loan amount/Loan disbursed amount	¥6,969 million/¥3,398 million
Exchange of notes/Loan agreement	November 1989/January 1997
Terms and conditions	
Interest rate	1.0% p.a.
Repayment period (grace period)	30 years (10 years)
Procurement	Partially untied
Final disbursement date	January 1999

## 2. Results and Evaluation

### 2.1. Relevance

To meet the growing demand for telephones, the project aimed to increase telephone line capacity in Aden to 49,200 lines, the then forecasted demand volume for 1995. After the project appraisal, unavoidable external factors, including the unification of North and South Yemen and the ensuing political instability caused by civil war, delayed the commencement of the project, making it impossible to meet the demand increased in the meantime. Increasing telephone line capacity and replacing obsolete switching machines under the project, however, greatly contributed to meeting this demand and to improving the quality of communications services.

The Republic of Yemen's 5-year development plan for the period from 1996 to 2000 included the installation of approximately 300,000 additional lines for the Public Telecommunications Corporation (PTC) as a whole to improve the local telephone networks, and the development of a main transmission network using optical fiber cables. The objective of the project corresponded with those aspects of the 5-year plan targeting expansion and improvement of local telephone networks in major cities countrywide, and the modernizing of telephone lines. The project thus contributed to the realization of the five-year plan.

Telephone demand in the Aden area has been expected to increase further as the development of free trade zone progress has gradually progressed in Aden Port since 1999. Outside the scope of the project, PTC is installing additional telephone lines on a continuous basis, using its own funds, to meet growing demand\*. In light of the

above, meeting telephone demand continues to be a priority issue and the plan for this project remains relevant.

Alterations were made to the scope of the project due to changes in the environment during the period from planning to implementation. Although the total telephone line capacity for switching machines was not altered, because of the priority placed on meeting demand additional measures, such as installing switching machines at one more telephone exchange (Tawahi Exchange), were taken. The number of lines at other telephone exchanges was subsequently adjusted, and the number of primary cables increased. The installation of these additional switching machines is aimed at meeting communications demand in Aden in quantitative terms, and the plan is considered relevant.

\* The installation of an additional 11,000 lines was completed in March 2001.

## **2.2. Efficiency**

### **(2.2.1.) Project Cost**

The foreign currency portion of actual project cost, which was fully covered by the ODA loan, totaled ¥3.398 billion, 48.8% of the ¥6.969 billion estimated at the time of appraisal.

The principal reasons for this were: (1) delays in bidding procedures, due to political instability and other factors, which resulted in the executing agency constructing part of the optical fiber transmission network using its own funds prior to the commencement of the project, (2) the continued appreciation of the yen against the local currency, and (3) price competition produced by international competitive bidding, which meant equipment could be purchased at lower cost than planned.

Most of the increase in project cost incurred by the change in scope, described in Section 2.1, was absorbed by reducing the ODA loan for inter-exchange relay radio facilities (the remaining portion was covered by PTC's own funds) and excluding the planned installation of new public telephones.

### **(2.2.2.) Implementation Schedule**

Project completion was initially scheduled for May 1994, but the project was actually completed in February 1999, nearly five years later. This was the result of unavoidable delays in the preparation of bidding documents and the signing of the loan agreement, produced by the confusion following the Yemeni unification in 1990 and the political instability that accompanied the civil war of 1994. By contrast, the actual time required to manufacture, install and test equipment was 24 months, only three months longer than the 21 months initially predicted: there has been no problem in this regard.

## **2.3. Effectiveness**

### (2.3.1.) Meeting Fast-Growing Telephone Demand

After implementation, telephone line capacity in Aden increased to the planned 42,000 lines. The telephone penetration ratio for the Aden area increased rapidly, from 5.1% in 1998 to 8.7% in 1999 (the year the project was completed), far surpassing the national average of 1.7%, and giving the city a penetration ratio comparable to that of the capital, San'a (Sanaa) (7.7%, see Table 1). Nonetheless, year on year increases in the number of applicants for telephone service subscriptions means that the waiting list continues to grow, reaching approximately 22,000 households in 2000.

After additional telephone lines were installed under the project, primary cable installation work was performed swiftly for households put on the waiting list, yielding a use ratio exceeding 90% in 2000.

**Table 1 Telephone Services in the Project Area**

Year	1997	1998	1999 (project completion date* <sup>1</sup> )	2000
Telephone line capacity* <sup>2</sup> (1) (lines)	26,301	26,301	49,200	49,200
No. of lines currently in use* <sup>2</sup> (2) (lines)	21,209	26,292	40,028	45,191
Use ratio = (2) / (1) (%)	80.64%	99.97%	81.36%	91.85%
No. of households on a subscription waiting list (3)	10,605	13,146	20,013	22,598
Actual demand (2) + (3)	31,814	39,438	60,041	67,789
Penetration ratio for telephones in Aden* <sup>3</sup>	4.89 lines	5.10 lines	8.69 lines	9.96 lines

Source: PTC data

\*1 The project was completed in February 1999.

\*2 Telephone line capacity refers to the capacity of facilities; the number of lines currently in use refers to the number actually used for telephone services.

\*3 The penetration ratio refers to the number of telephones installed per 100 population. The number of telephones equals the number of main telephones, that of primary cables or that of subscribers.

PTC is continuing to install additional telephone lines with the aim of meeting telephone demand in the Aden area. By December 2000, the corporation plans to have installed a total of 11,000 new telephone lines -- 4,500 for the Khormaksar Exchange, 3,500 for the Tawahi Exchange, 1,500 for the Little Aden Exchange and 1,500 for the Madinet Al-Shaab Exchange.

### (2.3.2.) Improving the Quality of Telephone Services

The introduction of digital equipment under the project improved the reliability of general telephone services, as exemplified by reduced noise during calls and improved telephone call completion ratio. Other effects include easier data transmission via telephone lines due to less noise and faster communication speeds.

In addition, the utilization of digital switching machines and the development of software have enabled the provision of new services such as ISDN and restricted

telephone service plans\*.

\* Services in which the basic fee is kept low by limiting services to call receiving or local calls only.

### **(2.3.3.) Effects of Introduction of Automatic Call Charge Computation System**

PTC introduced an automatic call charge computation system in conjunction with the installation of digital switching machines, thus substantially reducing the labor of computing charges for its subscribers and facilitating prompt billing.

### **(2.3.4.) Financial Internal Rate of Return (FIRR)**

At the time of appraisal, the FIRR was predicted to be 15.3%. The calculation of the FIRR based on actual revenue and expenditure data obtained during a recent survey, revealed that the FIRR was 14.0%, slightly lower than initially projected. Calculations were made using the cost for facilities installed under the project and maintenance costs as expenditures, with post-project increases in revenues for the telephone exchanges in Aden seen as benefits.

## **2.4. Impact**

### **(2.4.1.) Revitalization of Social Activities in Information/Communications and Other Fields**

Since unification in 1990, the population in the Aden area has increased year on year and further increases are expected following the 1999 start of the development of free trade zone in Aden Port . The project met the demand for communications facilities in quantitative terms and improved communications service in qualitative terms, thereby satisfying telephone demand in Aden and contributing to the revitalization of social activities and the promotion of local communities. In addition, the introduction of digital equipment helped increase communication speeds and helped improve data transmission quality, thus expediting data transmission via the Internet and other modes. The project has thus contributed to improved information and communications services in the project area.

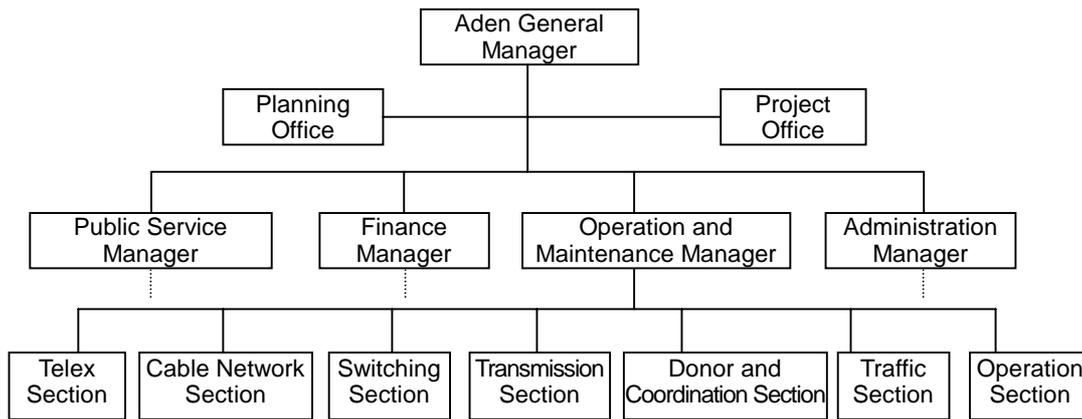
### **(2.4.2.) Environmental Impact**

Given the nature of the facilities, there has been no particular impact on the environment.

## **2.5. Sustainability**

### **(2.5.1.) Operation and Maintenance**

The Aden Branch of PTC is responsible for the operation and maintenance of the facilities. The branch office currently employs 1,030 people, of which approximately 370 are engaged in the operation and maintenance of facilities.



**Figure 1 Organizational Chart of PTC's Aden Branch**

PTC personnel are receiving training on equipment operation and on troubleshooting from the project suppliers. The training started immediately after project completion and will continue for the three years, until February 2002.

**(2.5.2.) Financial Status**

Since PTC employs measures such as the temporary suspension of services for subscribers who fail to pay their bills, the telephone charge collection ratio in the Aden area is generally good, 84% in 1998 and 86% in 1999. Generally speaking, operation and facilities maintenance are being executed on a self-funded basis, and the corporation does not depend on the government for subsidies.

In Yemen, the privatization of telephone services is progressing, and two private operators, Sabafon and Space-Tele Yemen, are engaged in the provision of cellular phone services. International telephone services are provided by Tele-Yemen, a joint venture between British and Yemeni corporations, each holding a 50% stake in the firm. To date, there are no plans to privatize PTC, which is responsible for domestic communications services.

**(2.5.3.) Sustainability**

The use ratio for facilities installed under the project is high, and telephone demand in Aden is expected to continue to grow. The status of subscribers' payment for telephone charges is also generally good, and there appear to be no overall problems with the finances of the executing agency.

In terms of operation and maintenance (O&M), however, PTC personnel have not acquired sufficient technical skills, although the hardware aspect of O&M has improved. The Aden Branch is currently working to make improvements in this respect, but it will be necessary to continue to improve technical ability, by providing employee training for example.

## Comparison of Original and Actual Results

Item	Plan	Results
1. Project scope	<ul style="list-style-type: none"> <li>· Digital switching machines for six telephone exchanges               <ul style="list-style-type: none"> <li>- Maala Exchange 13,200 lines</li> <li>- Crater Exchange 11,000 lines</li> <li>- Khormaksar Exchange 4,000 lines</li> <li>- Al-Mansurah Exchange 16,500 lines</li> <li>- Little Aden Exchange 3,800 lines</li> <li>- Madinet Al-Shaab Exchange 700 lines</li> </ul> <p style="text-align: right;">(Total: 49,200 lines)</p> </li> <li>· Access network (primary cable)               <ul style="list-style-type: none"> <li>- Maala Exchange 9,840 pairs</li> <li>- Crater Exchange 7,100 pairs</li> <li>- Khormaksar Exchange 540 pairs</li> <li>- Al-Mansurah Exchange 14,700 pairs</li> <li>- Little Aden Exchange 4,160 pairs</li> <li>- Madinet Al-Shaab Exchange 840 pairs</li> </ul> <p style="text-align: right;">(Total: 37,180 pairs)</p> </li> <li>· Inter-exchange relay lines               <ul style="list-style-type: none"> <li>- Maala - Crater 1,700 ch 1+1</li> <li>- Maala - Khormaksar 3,100 ch 2+1</li> <li>- Khormaksar - Al-Mansurah 2,300 ch 2+1</li> <li>- Al-Mansurah - Al-Shaab 940 ch 1+1</li> <li>- Al-Shaab - Little Aden 800 ch 1+1</li> </ul> <p style="text-align: right;">(Total: 8,840 ch)</p> </li> <li>· Long-distance relay switching machines (800 lines)</li> <li>· Telephone sets 37,400 units</li> <li>· Installation of air-conditioners in four telephone exchanges</li> </ul>	<ul style="list-style-type: none"> <li>· Digital switching machines for seven telephone exchanges               <ul style="list-style-type: none"> <li>- Maala Exchange 10,400 lines</li> <li>- Crater Exchange 11,000 lines</li> <li>- Khormaksar Exchange 4,500 lines</li> <li>- Al-Mansurah Exchange 18,000 lines</li> <li>- Little Aden Exchange 1,500 lines</li> <li>- Madinet Al-Shaab Exchange 1,000 lines</li> <li>- Tawahi Exchange 2,800 lines</li> </ul> <p style="text-align: right;">(Total: 49,200 lines)</p> </li> <li>· Access network (primary cable)               <ul style="list-style-type: none"> <li>- Maala Exchange 16,200 pairs</li> <li>- Crater Exchange 16,100 pairs</li> <li>- Khormaksar Exchange 9,600 pairs</li> <li>- Al-Mansurah Exchange 21,000 pairs</li> <li>- Little Aden Exchange 1,960 pairs</li> <li>- Madinet Al-Shaab Exchange 5,800 pairs</li> <li>- Madinet Exchange 7,600 pairs</li> </ul> <p style="text-align: right;">(Total: 78,200 pairs)</p> </li> <li>· Inter-exchange relay lines               <p>A total of 6,210 ch of lines were covered by the ODA loan and the rest of the lines by PTC's own funds.</p> </li> <li>· Long-distance relay switching machines (800 lines)</li> <li>· Telephone sets 36,900 units</li> <li>· Installation of air-conditioners in seven telephone exchanges</li> </ul>
2. Implementation schedule	September 1992 to May 1994 (21 months)	May 1997 to April 1999 (24 months)
3. Project cost		
Foreign currency	¥6.969 billion	¥3.398 billion
Local currency	YD2.32 million*	N/A
Total	¥7.823 billion	N/A
ODA loan portion	¥6.969 billion	¥3.398 billion
Exchange rate	YD1.00 = ¥368 (January 1989)*	

\* The Yemen dinar (YD), the currency of the former South Yemen, was abolished upon unification and the introduction of the new currency, the Yemen rial (YR), in 1990.