PN-AAK-367

ISN = 17

CILSS

CLUB DU SAHEL
Transport and Infrastructure Working Group

SAHEL DIAGNOSTIC ROAD MAINTENANCE STUDY

INTERIM REPORT

MARCH 1977

Submitted by

LOUIS BERGER INTERNATIONAL, INC.

in association with

INGECOT

financed by

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

CILSS

CLUB DU SAHEL
Transport and Infrastructure Working Group

SAHEL DIAGNOSTIC ROAD MAINTENANCE STUDY

INTERIM REPORT

MARCH 1977

Submitted by

LOUIS BERGER INTERNATIONAL, INC.

in association with

INGECOT

financed by

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

S A H E L D I A G N O S T I C R O A D
M A I N T E N A N C E S T U D Y

INTERIM REPORT

prepared for:

Transport and Infrastructure Working Group

Club des Amis du Sahel

by:

Louis Berger International, Inc.
Ouagadougou, Abidjan, East Orange

INGECOT
Ouagadougou, Abidjan

March 1977

1. INTRODUCTION

1.1 Purpose of the Study

While longer term coherent infrastructure and transport projects and programs are being developed for countries of the Sahel Region, the Infrastructure and Transport Working Group of the Club des Amis du Sahel identified road maintenance as an urgent need to which practical responses could rapidly be formulated. As a consequence, the Diagnostic Road Maintenance Study was proposed and oriented toward the delineation of immediate action elements within the framework of a medium-term, six-year program (1977-82).

In the terms of reference, the purposes of the study were broadly defined as:

1) the restoration of the road network and the maintenance of principal roads at optimal levels (based on economic considerations);
2) the reinforcement of the means and organization of road maintenance services (equipment, materials, organization and manpower training) in a way which most efficiently utilizes limited personnel and financial resources.

The present Interim Report is a small first step toward the realization of these purposes.

Proceeding on a country-by-country basis, the consultant has sought to identify and define (within an order of magnitude) those road rehabilitation and maintenance needs which merit "immediate" action as well as the basic requirements of a "minimum" maintenance program.

Immediate actions are defined as those which are needed now, and are achievable within a two-year period. The minimum program is defined as that which achieves a level of maintenance within six years which prevents further deterioration of the road infrastructure. The definition also recognizes the need, in many cases,

to rehabilitate roads to levels at which routine maintenance procedures are cost effective. In the case of Cap Vert a minimum program could not be defined due to inadequate data.

Thus, the present report seeks to estimate and underline the volume of resources required for so-called minimum programs. Compared to present resource allocations for road maintenance, these are quite large - and they represent the minimum!

1.2 Contents of the Interim Report

The Interim Report on the Diagnostic Road Maintenance Study is designed to be a discussion document for the March 24-26 meeting of the Infrastructure and Transport Working Group. In this role, it seeks to present a concise resumé of present road maintenance conditions in each country together with order of magnitude estimate of resource requirements for immediate and minimum programs.

Each country is treated as a separate chapter in the report. The analysis of present maintenance conditions is presented in terms of:

1) the road network and traffic (1977 and 1982);
2) present maintenance organization, means and methods;
3) unit costs of rehabilitation and maintenance.

From this basis, immediate and minimum program requirements have been established for the 1977-82 period. These requirements are presented in the following order:

1) rehabilitation requirements;
2) maintenance requirements;
3) minimum program description and overall resource requirements;
4) training and technical assistance needs (if any).

2

CAPE VERDE ISLANDS

2.1 Summary

The Cape Verde Islands present road maintenance problems which are unique among the countries of the Sahel. A mountainous topography, mid-ocean location, extensive use of cobblestone paving, and an embryonic road network (758 kms) make Cape Verde a case apart.

The Cape Verde road network presently consists of 313 kms of cobblestone road (223 kms at 6m width and 90 kms at 3.5m width), 162 kms of improved earth roads and 283 kms of unimproved tracks--a total of 758 kms. By 1982, the total network is expected to reach 871 kms.

Lack of road inventory, unit costs, traffic and user cost data makes the establishment of "minimum program" requirements impossible at this time. Instead, an immediate action program is recommended for implementation over the next two years with a total estimated cost of 72.673m Escudos (US$2.27 mil.). One of the immediate action elements is aimed at developing a longer term program.

Urgent rehabilitation needs result from landslide damages suffered by the paved road network during an intense storm in September 1976. Several roads are still blocked. While slide clearing has long since gotten underway, the Ministry of Public Works estimates a total of 43 million escudos (US$1.344 million) will be required to rehabilitate roughly 32 kms of damaged road (including structures) on three islands. This amounts to nearly 1.5 times the total 1976 MPW budget.

Also recommended for immediate action are the purchase of several equipment units, improvement of the mechanical workshop, and provision of technical assistance for basic data collection, maintenance planning and programming, purchasing and identification of external funding sources.

2.2 The Road Network and Traffic

The total length of the Cape Verde road network is estimated by the Consultant at 758 kms of which 313 kms are cobblestoned. Table 2-a presents a breakdown of the 1977 network by road type and island. Virtually no data exists on road condition traffic levels, vehicle fleet and user costs.

Table 2-b forecasts the 1982 road network based upon current efforts to widen 3.5m paved roads to 6m and possible new construction over the next six years. The network total by 1982 is forecast to reach 871 kms of which 345 kms paved at 6m width. It should be emphasized that this network growth rate of 10-15% is highly uncertain given the present paucity of data and programs. The allocation of the network for maintenance responsibility has not yet been legislated.

2.3 Existing Maintenance - Organization, Means and Methods

With limited resources (budget, personnel and equipment) the Ministry of Public Works has found it impossible to mount a continuous program of routine and periodic maintenance.

2.3.1 Organization and personnel

No separate entity responsible for road and related equipment maintenance has yet been established within MPW. At present, the responsibility rests with the Deputy Director for roads, airport, and harbors. The organization under his supervision is divided into two regional groups: windward (northern) and leeward islands.

2.3.2 Workshops and equipment

The Ministry's only workshop is located in the capital, Praia, and is of adequate size for the present equipment fleet. The workshop is immaculately maintained. However, workshop tooling is inadequate vis-a-vis present needs and must be supplemented (see Section 2.7). The workshop provides operators

and drivers for all MPW equipment and vehicles. A UNSO study has proposed equipment purchases totalling $253,000. These purchases are summarized in Table 2-c and would seem to be replacements for existing equipment, except for two flatbed trucks. It should be noted that no provision for spare parts has been made. Present equipment fleet is listed in Table 2-d

2.3.3 Present maintenance procedures

Due to the resource constraints cited previously, no sustained road maintenance program exists in Cape Verde. Maintenance efforts have thus far been focused on rehabilitation of storm damaged roads with the objective of keeping them passable or reopening them, depending on the extent of the damage. It should also be pointed out that much of the cobblestone network is relatively new and has very low routine and periodic maintenance requirements.

Such routine and periodic maintenance as is carried out is labor-intensive; thus, equipment requirements are few. Surface repairs on older cobblestone sections are carried out by removing the stones, repairing the base, and replacing the stones at a cost including overhead of approximately 20 escudos (US$0.60)/m2. Such maintenance efforts are limited due to budgetary constraints, but the existing cobblestone roads outside of storm damaged areas are still in good condition.

2.3.4 Financial resources and constraints

The Consultant has not yet been able to estimate the financial resources allocated to road maintenance. However, the MPW budget for the first two quarters of 1976 totaled ES 7.524 million (US$235,000) or 6.3% of the National Budget*; it seems unlikely that any of these funds were used for road maintenance. According to the "Buletim Trimestral", import

---

* Source: "Buletim Trimestral de Estatistica", CABO VERDE, 1976 (1st and 2nd Trimestres).

taxes on fuels are earmarked for road works. However, it is thought that such taxes, totaling ES 813,600 ($25,425) during the first two quarters of 1976, were not passed on to the MPW budget.

Beyond the budgetary constraints, there are also those imposed by the topography and island character of Cape Verde: costs of construction are very high due to large earthwork quantities, retaining walls and slope stabilization measures. Further, it is difficult to move personnel and equipment from one island to the next.

2.4 Unit Costs

As a consequence of the limited nature of road maintenance activities and record-keeping in Cape Verde, virtually no unit cost data is available. However, it is known that labor used in setting cobblestones is paid approximately ES 55/day ($1.80) for 6 m^2 of work. The stones themselves cost about ES 40/m^2. The cost/m^2 of a cobblestone surface is thus about ES 50 plus overheads.

2.5 Rehabilitation Requirements

2.5.1 Immediate Needs

Immediate rehabilitation needs focus on the repair/re-opening of roads damaged during the heavy rainstorm of September 1976. Table 2-e presents a summary of the work required and related costs, which total an estimated ES 43 million ($1.344 million) of reconstruction over 31.5 kms of road on three islands.

2.5.2 Minimum Programme Requirements

As no road inventory data exists, it is not possible at this juncture to specify the minimum rehabilitation requirements during 1977-82.

2.6 Maintenance Requirements

2.6.1 Immediate Needs

MPW urgently requires two types of assistance for road maintenance:

1) Road maintenance planning assistance including data base development, determination of priorities, programs and resource requirements, to enable an efficient routine and periodic maintenance effort;
2) Provision of critical heavy equipment and workshop items which will materially improve present maintenance capabilities of MPW.

Regarding the first point, the Consultant recommends a two-phase program of technical assistance dealing with the establishment of an information base requisite for maintenance planning, followed immediately by planning assistance itself. A total of 12 person-months over a six-month period would be required (see table 2-f) to produce a practical maintenance plan. The estimated cost of this program is ES2,300,000 ($72,000).

The second type of assistance concerns heavy equipment needs to handle rehabilitation works and workshop equipment/tooling to enhance present maintenance capabilities. Eventually, a means of moving equipment from island to island must be developed. However, for the present, individual program components are:

1) Heavy equipment, including a crawler-loader, wheel-loaders, curb-side dumpers, grader, compressors, cement mixers, wheel loaders with backhoes and low-boy trailers. Part of this equipment supplants items on the UNSO list (Table 2-c) , while the remainder complements it. Following achievement of rehabilitation work, this equipment would be used for regular construction and maintenance activities. The estimated cost is US$853,400 and the details are given in Table 2-h.
2) Shop-tooling for the workshop is Praia and a portable lubrication unit for Sao Antao. Total costs are $1200 with details given in Table 2-g.

2.6.2 Minimum Maintenance Requirements

Due to the lack of any usable data, it is not possible to establish minimum program requirements.

2.7 Recommended Programs and Resource Requirements

The action-programs recommended for the Cape Verde Islands road maintenance concern immediate needs only. The identification of minimum and optimal maintenance programs awaits the availability of basic planning data.

2.7.1 Immediate Programs

The immediate programs proposed are to be executed in two years (1977-79) and consist of:

1) Rehabilitation of 32 kms of cobblestone roads;
2) Road maintenance plan-technical assistance;
3) Equipment--rehabilitation, replacements
   --workshop tooling.

Cost details are shown in Table 2-h.

2.7.2 Minimum Program

To be defined during the immediate program phase.

2.8 Training

The definition of training needs must follow the formulation of a coherent maintenance program and identification of present skills by quantity and level. However, technical assistants can begin on-the-job counterpart training during the data collection and planning period. Particular emphasis in this training must be initially placed on procurement and materiel programming and control.

TABLEAU 2 -a

TABLE 2 -a

ISLES DU CAP VERT

Réseau Routier en 1977

1977 Road Network

(en kilomètres)

Isle Island	Type de Route - Type of Road					
	Routes pavées Cobblestone roads		Routes en terre am Improved earth road		Piste ordinaire Unimproved Tracks	Total
	6 m	3.5 m	6 m	3.5 m		
Sao Tiago	157	16	42	8	25	248
Sao Nicolau	-	18	-	11	38	67
Fogo	3	36	23	-	57	119
Sao Vincente	9	6	-	38	-	53
Sao Antao	54	14	-	22	163	253
Sal	-	-	18	-	-	18
Total	223	90	83	79	283	758

TABLEAU 2 - b
Table 2 - b

ISLES DU CAP VERT

Réseau Routier en 1982

1982 Road Network
(en kilomètres)

Isle Island	Type de Route - Type of Road					
	Routes pavées Cobblestone roads		Routes en terre am. Improved earth road		Piste ordinaire Unimproved Tracks	Total
	6 m	3.5 m	6 m	3.5 m		
Sao Tiago	173	-	52	10	25	260
Sao Nicolau	10	8	10	10	38	76
Fogo	13	26	30	10	50	129
Sao Vincente	15	-	18	30	5	68
Sao Antao	100	-	38	32	140	310
Sal	-	-	18	5	5	28
Total	311	34	166	97	263	871

Tableau 2 - c
Table 2- c

ISLES DU CAP VERT

PROPOSITION ACHAT DU MATERIEL UNSO

PROPOSED EQUIPMENT PURCHASES - UNSO

Designation Type	Nombre Number	Cout Unitaire Unit cost (escudos)	Cout Total	
			Escudos	US$
1. Flatbed Truck 30-T	2	1.200.000	2.400.000	80.000
2. Bétonniere 3/4 m3 Ciment Mixer	4	240.000	960.000	32.000
3. Bull D-6	1	2.460.000*	2.460.000	82.000
4. Land Rover	4	255.000	1.020.000	34.000
5. Dumper	2	150.000	300.000	10.000
6. Camion 70 T Truck	1	450.000*	450.000	15.000
TOTAL			7.590.000	253.000

Source: Ministère des Travaux Publics, 1976.
Ministry of Public Works, 1976.

* Couts très sous-estimes.
Costs highly underestimated.

Tableau 2-d
Table 2-d

ISLES DU CAP VERT

Inventaire et Evaluation du Matériel (1977)
Equipment Inventory and Evaluation (1977)

	1977 STATUS						AVAILABILITY				
	New	Good	Fair	Dead Lined	Re-tire	Total	1978	1979	1980	1981	1982
Dozer D-8	2			1		3	3	3	3	2	2
Dozer D-7				1		1	1	0	0	0	0
Dozer D-6		2			2	4	2	1	1	1	1
Loader 941		1	4		1	6	3	2	1	1	1
Loader 933				1	1	2	1	0	0	0	0
Mobile Crane	3					3	3	3	3	2	2
Compress. 125 CPM	9	1	1		7	18	10	8	7	7	7
Compress. 275 CPM	7	7	5		2	21	16	14	14	10	8
1 Bag Mixer			7			7	5	3	2	2	1
Steel Roller		1			1	2	1	1	1	1	1
Vibrat. Roller	1	2				3	2	2	2	1	1
Dump Truck			2		1	3	1	0	0	0	0
Flatbed Truck	15		17	6	8	46	28	22	18	15	15
Jeeps	7		10	2	2	21	14	10	8	7	7

Source: DNOP Records & Condition Reports.
Visual Inspection

Tableau 2-e
Table 2-e

ILES DU CAP VERT

Besoins immédiats en réhabilitation routière +
Immediate Road Rehabilitation Requirements

Isle/tronçon Is/and/road Link	longueur à remettre en état Length to be rehabilitated	Nature des travaux à réaliser Typeof work to be carried out	Devis estimatif Cost estimat. (milliers escudos)
SANTO ANTAO Porto Nevo Vila Rio Grande	1,5 km	Pétardage des rochers éboulés sur la chaussée, enlèvement des blocs et terre, construction de murs de retenu, repavage de la chaussée. Rock blasting, clearing, retaining wall construction, relaying of roadbed and cobblestones	4,800
SANTIAGO Fundara-Tarrafal	8,0	Réparation des ponts et dalots construction de murs de retenu stabilisation de pentes et repavage. Bridge and culvert repair, retaining wall slope stabilization, relaying of cobblestones	27.200
SANTIAGO Nazare-Praia-Baixo	5,5	Enlèvement de terre et rochers éboulés sur la chaussée, réparation des dalots, repavage. Clearing of earth and rock culvert repair, relaying of cobblestones	3.520
SANTIAGO Praia-Cida e-Velha	12,0	" " " " " " " Clearing of earth and rock culvert repairs relaying of pavement	5.760
SAO VINCENTE S.Pedro - Mindelo	4,5	" " " " " " " " Clearing and relaying of pavement	1,728
TOTAL	31,5 km	-	43,008

+ Source 1: Enquêtes auprès du Ministère des Travaux Publics, mars 1977
Interviews with Ministry of Public works officials, mars 1977

Tableau 2 - f
Table 2 - f

ISLES DU CAP VERT

PROGRAMME IMMEDIATE - ASSISTANCE TECHNIQUE
IMMEDIATE PROGRAM - TECHNICAL ASSISTANCE

Poste Position	Calendrier d'Intervention Timing		Hommes-Mois Person-Months	Cout* Cost (US$)
	1977 J, A, S, N, D	1978 J, F, M, A, M, J		
1. Ingénieur de l'Entretien Routier Maintenance Engineer			6,5	39.000
2. Economiste de Transports Transport Econ,			3,0	18.000
3. Ingénieur Mecanicien Mechanical Engineer			2,5	15.000
TOTAL			12,0	72.000

* Tout compris

Tableau 2-g
Table 2-g

ISLES DU CAP VERT

Proposition Achat Du Matériel
Proposed Equipment Purchase
(en prix 1977 - 1977 prices)

Designation Type	Nb No.	Coût Unitaire Unit Cost (000 US$)	Coût Total Total Cost (000 US$)
Rehabilitation et Entretien			
1. Bull[1] D-6	1	102	102
2. Chargeur à pneus[2] Deere 500 Wheel-Loader	2	55	110
3. Camion benne 10-T[3] 10T curbside dumptruck	7	23	161
4. Niveleuse - Grader G-12	1	62	62
5. Compresseurs 7,8 m^3/min	4		
" 275 CFM w/jackhammers[4]		23	92
6. Betonnières 0.75 m^3 Cement Mixers	2	7,5	15
7. Chargeur à pneus Deere 210 Wheel loader with backhoe	3	36	108
8. Remorques[2] 30-35T Lowboy trailers with front dolly	2	6.3	12,6
15% de la valeur No.1-7 pieces de rechange 15% of items 1-7 in spare parts			99,4
Frêts et Assurances Insurance and Freight (12%)			91.4
Soustotal			853,4
9. Outillage pour l'atelier central Tooling for main workshop			0,54
10. Unité de graissage (portable) Portable lubrication unit Sao Antao			1,16
Soustotal			1,70
Grand Total			854,1

Notes

1. Complément à Bull UNSO - Complements bulldozer proposed by UNSO
2. No 2 et no 8 sont combinés pour deplacer le materiel à chenilles (remplacent No 1 UNSO). No.2 & No.8 are combined to moved tracked equipment.(They replace the flatbeds proposed by UNSO)
3. Nécessaire pour les pavées et autres matériaux. Necessary for cobblestones and other materials.
4. Complément aux betonnières UNSO - Complements UNSO proposed cement mixers.

Tableau 2 - h
Table 2 - h

ISLES DU CAP VERT

PROPOSITION DU PROGRAMME IMMEDIATE (1977-1979)
PROPOSED IMMEDIATE PROGRAM (1977-1979)

(en prix 1977 - in 1977 prices)

No. Action	Estimated Cost (millions of escudos and US$)				
	1977 escudos	1978 escudos	1979 escudos	TOTAL escudos	$
1. Rehab de 32kms de routes pavées Rehab. of 32 kms of cobblestone roads	10,750	21,500	10,750	43,000	1,344
2. Project Entretien Routier-Assistance Technique Road Maintenance Planning-Tech. Assistance	1,150	1,150		2,300	0,072
3. Matérial Equipment	27,309	-	-	27,309	0,853
Outillage Tooling	0,064	-	-	0,064	0,002
TOTAL	39,273	22,650	10,750	72,673	2,271

3

REPUBLIC OF CHAD

3.1 Summary

The following chapter is based principally on a report entitled Etude Preliminaire de l'Entretien des Routes en Terre produced by BCEOM in January 1977. As the level of detail of this report is similar to the Diagnostic Study in the other CILSS countries, no additional field work was carried out in Chad.

The present Chadian road network of 7258 kms includes 1900 kms of improved roads and is presently maintained or partially maintained over 46% of this length. An additional upgrading or network improvement of 560 kms is forecast over the next six years, and an increase under a minimum maintenance program to 54% of this network, including all improved roads and 31% of unimproved tracks (which carry a significant amount of traffic).

The present constraints limiting road maintenance consist of a declining recurrent budget allocation which results in an even greater decrease in operating funds and therefore a growing immobilization of equipment due to lack of spare parts or fuel. This situation also results in low morale and productivity of public works personnel.

The proposed minimum program involves an immediate investment of 2,500,000,000 FCFA in equipment, spare parts and improvements to public works facilities, and an investment in technical assistance to help organize this investment. The recurrent budget in 1982 will rise to 1120 million FCFA in 1977 francs from its present level of 200 million FCFA. This amount in future FCFA is 1803 million or nine times the present budget, at an inflation rate of 10% per year.

In order to realize this budget increase, part of the recurrent cost increase is proposed to come from foreign sources which would cover the foreign exchange component of recurrent costs, half of depreciation expenses and 79% (the foreign currency component) of

road rehabilitation costs. Even with this foreign financing, the local contribution would increase five times by 1982--a major financial effort for Chad. A training program is also recommended.

3.2 Road Network and Traffic

3.2.1 Network and traffic in 1977

The road network was reclassified into six service categories and three traffic categories during the 1976 BCEOM study. These are summarized in Table 3-a. Only 1/7 of the 7258 km network is improved and only 46% is presently maintained.

3.2.2 Network and traffic in 1982

There are several improvements in the Chadian road network forecast over the next six years. These include 470 kms of earth road to be upgraded starting in 1977 and 90 kms of paved road to connect Moundou with the Camerouns. These changes are reflected in Table 3-b.

A 3% traffic growth rate was assumed for the purpose of calculating additional kilometers to be maintained at higher traffic levels in 1982.

3.3 Present Maintenance Methods

3.3.1 Organization and personnel

The present maintenance organization consists of four maintenance subdivisions and a central workshop in N'Djamena, all under the Directorate of Public Works in the Ministry of Civil Engineering, Mines and Geology (see Figure 3-a). The number and location of subdivisions appears suited to the maintenance needs if sufficient personnel, equipment and operating funds

are made available. BCEOM has proposed a decentralization of the present centralized equipment maintenance organization.

There are 504 persons presently employed as road maintenance personnel either on contractual or permanent basis (see Table 3-c).

3.3.2 Workshops and equipment

The maintenance of equipment is the second constraint on road maintenance. This is shown by the lack of qualified personnel in the workshops (see Table 3-c). The tools in the central workshop are aged and insufficient as is the structure of the building itself. The stock of spare parts is largely "dead" as shown in Table 3-f.

The existing 295 units of equipment are listed in Table 3-e. This table shows that 47% of the existing equipment is salvageable for road maintenance program. Much of this equipment is presently immobilized for want of spare parts.

3.3.3 Present road maintenance and procedures

The road network can be divided into three categories: maintained, partially maintained and unmaintained, as shown in Table 3-g. Even the regularly maintained network is given only routine maintenance and no resurfacing. This is reflected in the fact that only 50% of "normal" maintenance funds are expended on the best-maintained roads.

The situation is also worsening as the road maintenance budget has decreased 27% in real terms from its peak in 1972. This decrease is magnified for equipment operating funds, as personnel costs have remained relatively constant. This appears to be a general budget problem as only 31% of the requested budget was allocated by the central government in 1974 and 1975.

The net result is a poor and declining level of road maintenance and an increasing percentage of machines immobilized

in the workshop due to lack of spare parts and fuel.

3.3.4 Constraints

As indicated above, the road maintenance budget is clearly the first constraint encountered by the Public Works Department. However, this is being rapidly translated into immobilized equipment which has become a second level constraint. Even with an increased budget, the immobilized equipment will limit the amount of road maintenance that can be carried out to a small percentage of the minimum requirements--equipment repair is a major bottleneck.

In addition, the lack of road maintenance activity for the above reasons over several years has limited the expected amount of work to be done and therefore the willingness of the personnel to return to former work levels without a major effort to change the orientation of the road maintenance organization. This is compounded by a lack of qualified personnel at the management levels (sector chief and above).

3.4 Unit Costs

Force account unit costs for various routine and periodic maintenance tasks are summarized in Table 3-h. Costs for road rehabilitation are assumed to be equal to road resurfacing plus localized reinforcement on laterite roads or twice the cost of localized reinforcement on improved tracks. The costs of maintenance or construction by contractor are not given.

3.5 Rehabilitation Requirements

3.5.1 Immediate needs

The requirements for road rehabilitation were defined for immediate needs by identifying those road links which have been improved, but have received partial or no maintenance in the last five years. These links, totaling 281 kms, are listed in Table 3-i along with the estimated cost of rehabilitation. The breakdown of this cost into components is given in Table 3-j.

3.5.2 Minimum program

The number of kilometers of road in the Chadian network to be rehabilitated in addition to the immediate needs identified above are not known. Identification of specific sites depends on a road inventory indicating surface condition which is not available. The number of kilometers in question is estimated as a minimum of 20% of the improved road network in 1982. The result is also shown in Table 3-i.

3.6 Maintenance Requirements

3.6.1 Immediate needs

The immediate needs consist of first providing spare parts to put existing equipment back in working order. This operation will require substantial supervision which must probably come from technical assistance. These costs are shown in Table 3-p.

3.6.2 Minimum program

The basic annual budget for the minimum maintenance program on 3732 kms of roads is shown in Table 3-k. This cost includes depreciation as shown. The depreciation item is not disbursed

annually, but should be equivalent to a contribution to an equipment replacement fund.

This basic budget represents the amount in constant prices needed to maintain the road network in 1982. The actual future cost must be determined through an inflation rate.

3.7 Program Description and Resources

3.7.1 Immediate needs

The immediate resource needs for spare parts, equipment and technical assistance are shown in Table 3-p. These resources are programmed for the first two years of the six year program. High priority rehabilitation cannot begin until the equipment is ready in 1978.

A training program with an on-the-job brigade element is also considered a high priority item, along with adequate operating funds.

3.7.2 Minimum program

The minimum program is designed to arrive at a minimum* maintenance of 3732 kms by 1982. This means an infusion of equipment, spare parts and technical assistance to provide the means for road maintenance early in the program. In addition, training programs must be set up to provide the necessary personnel, (see Section 3.8 below).

The minimum operating budget was established by increasing the present budget (estimated at 200 million FCFA) to the size of the future minimum budget (253 million FCFA) plus rehabilitation and an equipment replacement fund allotment represented

---

* Minimum, as defined in the BCEOM Report.

by depreciation. This total amount was then inflated by a compound rate of 10% per year to estimate future costs. The result is shown in Table 3-o.

An additional budget for technical assistance is shown in Table 3-p, along with the immediate investment needs. Personnel, workshops and equipment requirements are shown in Tables 3-n and 3-l respectively.

An estimation was made of future participation of foreign donors in the operating budget. The value of the foreign exchange component (45%) plus one-half of the depreciation and 79% (the foreign component) of the rehabilitation program was used as the possible contribution of foreign donors. This contribution is not presently provided by donors except in terms of specific projects or through general subsidy to the government budget. However, at least, this level of contribution (830 MFCFA by 1982) will be necessary to achieve the minimum program. The Chadian contribution must still increase nearly five times over the 1977-82 period--a major effort considering the recent declines in the maintenance budget.

3.8 Training Programs and Technical Assistance

Chad has been provided with several types of training programs for public works technicians as shown in Table 3-d. These include a successful on-the-job training program with technical assistance by O.R.T. that needs additional support in terms of a periodic maintenance or rehabilitation school brigade. This type of training is clearly the most pertinent, and a continuing program for the required technical assistance is described above. The school brigade would be operated with the equipment and operating budget shown above in the minimum program.

Sufficient candidates should also be supplied to the training programs existing in Chad to ensure the needed technicians and adjoints techniques. Five engineering and management personnel must be trained outside of Chad to fulfill minimum program requirements (see Table 3-n). A schedule of proposed technical assistance is shown in Figure 3-b.

Tableau 3-a

Table 3-a

Tchad

	Réseau Routier 1977 (Km) Road Network						
	Route Bitumee Paved Road)	Route en Terre Amél. (Laterite Road)	Route en Terre Ord (Earth Road)	Piste en Terre Amel. (Laterite Track)	Piste en Terre Amen. (Impr Earth Track)	Piste non amenagée (Unimproved Track)	Total
Total +	242	671	374	79	541	5351	7258
Entretenu ++ (Maintained)	242	671	321	79	488	1542	3343
°/° Entretenu (Maintained)	100%	100°/°	186°/°	100°/°	90°/°	29°/°	46°/°
Trafic							
30à60 véh/jour (30à60veh/day)	242	481	133	79	132	210	1275
10à30véh/jour (10 to 30veh/day)	–	190	53	–	150	735	1128
Moin que 10véh/jour (Less than 10veh/day)	–	–	190	–	259	4406	4855

\+ Total routes classées nationales et prefectorialles =(Total roads classified as nationalor prefect.)

++ Entretenu au moins 2 fois dans les derniers six ans =(Maintained at least twice in the last six years.)

Table 3-b

Tchad

	Réseau Routier Road Network 1982 (Kr)						
	Route Bitumée Paved+++ Road)	Route en Terre Amél. (Laterite+ Road)	Route en Terre Ord. (Earth Road)	Piste en Terre Amél. (Laterite Track)	Piste en Terre Amen (Improved Earth Track)	Piste non-Amenagée (unimproved Track)	Total
otal ++	332	1141	321	79	541	4997	7411
ntretenu aintained)	332	1141	321	79	541	1560	3974
/o Entretenu /o (Maintained)	100°/°	100°/°	100°/°	100°/°	100°/°	31°/°	54°/°
rafic							
)à60véh/jour "(véh/day)	332	821	131	79	232	355	1951
)à30véh/jour " (véh/day)	-	320	190	-	125	1535	2170
oins que 10veh/jour ess than 10veh/day)	-	-	-	-	184	3106	3290

Sélon l'hypothese que les 470 Km d'améliorations en project de l'UNSO seront completés.
Under the assumption that the 470 Km of improvements proposed by UNSO will be completed.)

+Total routes classées plus la route Ati-Ifenant en project par l'UNSO et la route Moundou-Camerouns.
otal classified roads plus the Ati-Ifenant road under design by UNSO.)

++ Une route bitumée entre Moundou et la frontière Camerounaise est probable d'ici 1982.
(A paved road will probably be constructed from Moundou to the Cameroun border before 1982.)

GRAPHIQUE 3-a
FIGURE 3-a

ORGANIGRAMME DES SERVICES DE L'ENTRETIEN ROUTIER
ORGAINZATION DIAGRAM OF THE ROAD MAINTENANCE SERVICES

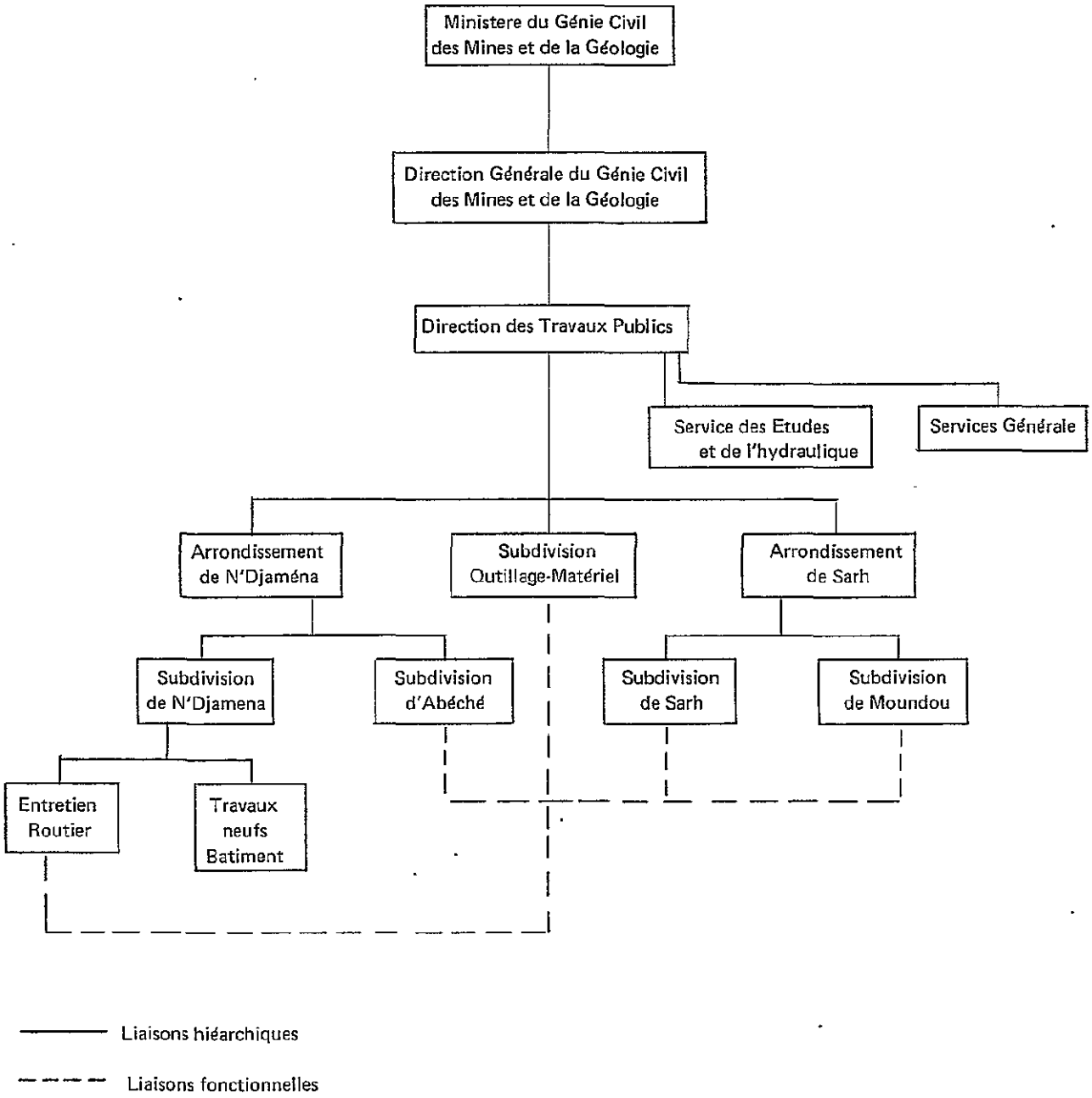


Tableau 3 - c suite
Table 3 - c continued

TCHAD

	DTP*	SOM	SEH	Arrt. N'DJ		Arrt. Sarh		Total
Divers	9	4						13
Total	81	58	-	-		-		139
3. Personnel journalier permanent (Daily)				NDJ	Abache	Sarh	Moundou	
Chef de chantier	-	-	-	1	-	1	1	3
Chauffeur	(1)	4	-	23	4	12	14	58
conducteur	-	2	-	14	5	8	9	38
Aide - conducteur	-	-	-		-	-	2	2
Mécanicien	(2)	12	-	10	3	5	3	35
Aide-mécanicien	(7)	25	-	-	-	1	3	36
Graisseur	-	-	-	11	3	5	7	26
Soudeur/forgeron	(8)	3	-	2	1	-	-	15
Electricien	-	5	-	-	1	-	-	6
Tourneur	-	1	-	-	-	-	-	1
Magasinier	(1)	9	-	1	1	1	-	13
Macon	-	-	-	1	2	2	1	6
Pointeur	-	-	-	2	-	-	-	2
Commis	-	1	-	1	-	1	1	4
Manoeuvre	-	-	-	11	-	-	-	11
Capita	-	-	-	1	-	-	-	1
Dactylo	(1)	2	-	1	-	-	-	4
Gardien	(2)	5		2	1	1	1	12
Total	(22)	69	-	81	21	37	43	273
Total Général	117	147	19	122				504

Tableau 3- c suite
Table 3- C continued

TCHAD

Source: Etude Preliminaire de l'Entretien des Routes en Terre BCEOM 1977, pp. 3.15 - 3.17

DTP = Direction des Travaux Publics (Directorate of Public Works)

SOM = Subdivision Outillage Materiel (Subdivision of Tools and Equipment)

SEH = Service des Etudes et de l'Hydraulique (Service of Studies and Hydrology)

Arrt. = arrondissement

N'DJ = N' Djamen a

Tableau 3 - d
Table 3 - d

TCHAD

MOYENS ACTUELS EN FORMATION
PRESENT TRAINING RESOURCES

Institution	Type de formation	1976 - 1977 Nombre d'effectifs Number of students	Observations
. Ecole Nationale des Travaux Publics (ENTP)	Adjoint technique	113 (dont of which) 50% Tchadiens 50 % spécialise en TP in PW	Programme de 4ans 4 years program
. Collège et Lycée technique	Technicien (Bac)	13 par an gradués	Programme de 3ans 3 years program
	" (diplôme CAP)	8 par an " (graduated per year	A être élargie 2,5 fois en 1977 78 (to be expanded 2,5 times)
. Centre de Formation professionnelle et de perfectionnement (CFPP)	Technicien (diplômé CAP)	100 par an 100 per year)	Programme de 2ans la plupart des gradués vont au secteur privé (2 yearsprogram) Most graduates go to the private sector
. Mission O.R.T.	Recyclage du personnel du Ministère au Génie Civil (retraining of Ministry of Civil Engineering personnel)	127 formé en 2 ans (trained in 2 year)	Théorie et pratique (Both theony and practical work)

urce : Etude Préliminaire de l'Entretien des Routes en Terre, BCEOM, 1977 pp 3.18 - 3.22

Tableau 3-e
Table 3-e

Tchad

Resume due Materiel Existant et du Materiel Recuperable
Summary of Existing Equipment and of Salv geable Equipment

Type de Materiel Type of Equipment	Nombre Existant Existing Number	Nombre Recuperable Salvageable Number		
		bridades	reserves	Total
1. Tracteurs equip en Bull D7 (Bulldozer D7)	3	1	1	2
2. Tracteurs equip en Bull D6 (Bulldozer D6)	4	0	1	1
3. Niveleuses CAT N120-99 (Graders)	16	8	3	11
4. Niveleuses Richier N530 (Graders)	15	0	0	0
5. Chargeurs ssur pneus (frontend loaders on tires)	2	1	1	2
6. Chargeurs sur-chenilles (front end loaders on treads)	9	0	1	1
7. Tracteurs agricoles (agricultural tractors)	8	0	2	2
8. Tracteurs Routiers (highway tractors)	7	5	2	7
9. Remorques porte-engin (low boy trailers)	7	5	2	7
10. Rouleaux à pneus tractes (wobble wheel compactors)	9	0	0	0
11. Compacteurs auto-moteurs (self propelled compactors)	29	12	6	18
12. Camions beunes (damp tructs)	63	34	13	47
13. Camions citernes (tank trucks	72	18	6	24
14. Pickup landrover	9	1	2	3
15. Pickup Peugeot	12	1	1	2
16. Fourgonettes (van)	4	4	0	4
17. Moto pompes	19	6	2	8

Source: Etude Préliminaire de l Entretien des Routes en Terre. BCEOM, 1977, p. 3.13

Tableau 3-f

Table 3-f

TCHAD

Installations Desservants l'Entretien Routier

Installations Supporting Road Maintenance

	SOM N'Djaména	Subdivision Abeché	Subdivision Moundou	Subdivision Sarh	Subdivision N'Djaména
1. Aires de (m^2) (Area of)					
Terrain	7,500	20,000	13,000	18,508	1,700
Bureau (offices)	200	12	15	20	15
Ateliers (workshop)	1,975	625	455	630	650
Magazin (store)	200	120	287	150	120
Station service	250	1 station	1 station	1 station	
Observations	pas fonctionelle	il faut plus d'abrit	il faut plus d'abrit	abrit a construire	pas fonctionelle
2. Outillage (Tools)					
Nombre de Unites	26	11	7	19	13
Observations	50% a reformer (to be junked) 6 en bon (in good cond.)	6 a reformer (to be junked) 5 recuperable (salvageable)	2 a reformer (to be junked) 2 en bon etat (in good cond.)	8 en bon état (in good cond.) 4 manque accessoires 4 a reformer (to be junked)	en médiocre ou mauvais etat (in poor or bad condition)
3. Pièces de Rechange (spare parts)					
Valeur (FCFA)	175,900,000	5,000,000	10,000,000	32,000,000	3,000,000
Observations	60% morts (dead stock)	90% morts (dead stock)	la plus part mort (mostly dead stock)	un part mort (partly dead stock)	pres du SOM pas très utile near the SOM (not very useful)

Source: Etude Préliminaire de l'Entretien des Routes en Terres, BCEOM, 1977, pp. 3.1-3.14.

Tableau 3-g

Table 3-g

TCHAD

Entretien Routier Effectué Actuellement

Road Maintenance Presently Carried Out

	Réseau Regulierement Entretenu (Regularly-Maint. Network)	Réseau Partiellement Entretenu (Partially-Maint. Network)	Réseau Non-Entretenu (Unmaintained Network)
Dimension Nombre de Km. % du réseau (of network)	1.800 26%	1.300 18%	3900 56%
Type Entretien manuel (Manual maintenance)	80% du réseau en moyenne (of the network in average)	20% en moyenne (in average)	N.A.
Reprofilage-compactage (grading-compacting)	1 a 2 campagnes par an (1 to 2 treatments per year)	1 campagne par 2 ans en moyenne (1 treatment in 2 years on average)	N.A.
Reprofilage à sec (dry grading)	tres peu (very few)	--	N.A.
Rechargements (Resurfacing)	localises et faibles (localized and small)	--	N.A.
Depenses Dépenses par km (expenditure per km)	50,000 - 150,000 FCFA	10,000 a 40,000 FCFA	N.A.
% des dépenses normals* (% of normal expenditure)	50%	20%	

N.A. = Non applicable (not applicable)

Tableau 3-g (suite)
Table 3-g (continued)
(continued)

Evolution du Budget (change in Budget)	1970	1971	1972	1973	1974	1975
(millions FCFA) Francs courants	166	194	213	200	173	188
(francs constants) (1976)	(222)	(254)	(270)	(247)	(191)	(198)
Budget Demandé (Requested Budget)	N.D.	N.D.	342	467	556	611
% Budget Demandé			62%	43%	31%	31%

N.D. = non-disponible (not available)

* défini par les Travaux Publics (as defined by Publics Works)

Source: Etude Preliminaire de l'Entretien de Routes en Terres, BCEOM, 1977, pp. 5.1-5.3

Tableau 3-h
Table 3-h

TCHAD

Coûts Unitaires des Tâches d'Entretien Routier
Unit Costs for Road Maintenance Tasks

Tache (Task)	Observations	Coût Annuel par Km HT* Annual Cost per Km (w/o tax)
1. Routes Bitumées (Paved Roads)		(FCFA)
a) Entretien des accotements (Maintenance of shoulders)		92.000
b) Revêtement Périodique (Periodic Resurfacing)	1/6 du total chaque 6 ans 1/6 of the total each 6 years	900.000
c) Point à Temps (Patching)		N.D.
2. Routes en Terre**		
a) Rechargement Périodique (Periodic Resurfacing)	Applicable aux routes en terres et piste ameliorée (earth roads and improved track)	185.000
b) Reprofilage - Compactage (Reshaping - compacting)	"	93.000
c) Reprofilage à sec (Dry Reshaping)	toutes les routes (all roads)	17.000
d) Point à Temps (Patching)	toutes les routes a trafic >10 (all roads with traffic >10 veh/day)	42.000
e) Lutte anti-tale ondulée (Anti-washboard program)	toutes les routes en laterite (all laterite roads)	8.000
f) Renforcements Localisés (Localised reinforcement)	toutes les pistes (all tracks)	78.000

* Frais Généraux non-compris (overhead not included)
** Exemple de la zone sud (example using the southern zone)

Source: Etude Preliminaire de l'Entretien des routes en Terre, BCEOM, 1977. pp. 13.28-13.29

Tableau 3-i
Table 3-i

TCHAD

Besoins en Réhabilitation Routier
Road Rehabilitation Reguirements

	longueur (lengt))	type	coût en km (cost/km)	coût total HT (total cost w/o tax)
. Besoins immédiats+ (immediate reguirements)	(km)		(FCFA)	(F CFA)
a) Massaguet-Bir Garat	106	RTL	263 000	27 878 000
b) Massaguet-Karmé	53	RTL	263 000	13 939 000
c) Abeché-Bitine	92	PTA	156 000	14 352 000
d) Chagoua-Linia	30	RTO	263 000	7 890 000
Total	281			64 059 000
. Besoins Minimums (minimum needs) 20% du réseau amélio -ré entretenu				
routes	180	RT	263 000	47 340 000
pistes	95	PT	156 000	14 820 000
Total	275			62 160 000
. Total Besoins (total needs)	556	-	-	126 219 000

ource : calcul du Consultant à partir des chiffres du rapport BCEOM et tableau 3 h
(Consultants calculations based on figures from the BCEOM report and table 3 h)

TL = Route en terre latéritique, PTA = piste en terre aménagée
(road inlaterite) (improved earth track)
TO = route en terre ordinaire (earth track)
définie par route ou piste aménagée avec un entretien partiel ou inexistant pour 6 ans
(defined as improved road or track with partial or no maintenance in 6 years)
+ RT rechargement + renforcement localisé, PT = 2 fois renforcement localisé
(resurfacing + local reinforcement) (2 times local reinforcement)

Tableau 3-j
Table 3-j

TCHAD

Composants des Coûts de Réhabilitation
Rehabilitation Cost Components
(000 FCFA) (Hors taxes - without taxes)

	Coût Total (Total Cost	Amortissement (Depreciation)	Pièces Detachés (Spare parts)	Carburant et huile (fuel & oil)	Main D'oeuvre (Labor)*
	(100%)	(28%)	(26%)	(20%)	(26%)
Besoins Immediate (Immediate Needs)	64.059	17.937	16.655	12.812	16.655
Besoins Minimums (Minimum Needs)	62.160	17.404	16.162	12.432	16.162
Total HT (without taxes)	126.219	35.341	32.817	25.244	32.817
tal TTC** ns Amortisse-ment	110.000				

y compris équipes de chantier et d'atelier (including both field and maintenance crews)

with tax and without depreciation

Source: calculs du Consultant à partir du Tableau 3-i. (calculations of the Consultant based on Table 3-i.

Tableau 3-k
Table 3-k

TCHAD

Besoins en Entretien Routier Minimum (Programme de 3732 kms)
Minimum Road Maintenance Requirements (3732 kms program)
(millions de FCFA) (hors taxes-without taxes)

	Coût total (total cost)	Amortisse--ment (deprecia--tion)	Pièces détachées (Spare parts)	carb.lubri (fuel and oils)	Main d'oeuvre (labor)
. Entretien courant routine maintenance)					
'Djaména +	97,83	24,50	20,84	20,96	31,53
beché	23,07	6,13	5,53	5,31	6,10
arh	100,23	24,81	20,91	21,92	32,59
oundou	136,91	34,23	29,04	29,99	43,65
otal	358,04	89,67	76,32	78,18	113,87
. Entretien périoique (periodic aintenance)					
'Djaména ++	300,84	22,66	21,87	233,71+++	22,60
beché	-	-	-	-	-
arh	73,62	20,20	19,06	15,05	19,31
oundou	91,72	25,14	23,74	18,83	24,01
otal	466,18	68,00	64,67	261,59	65,92
. Frais généraux 15%)(oveshead)	123,63				
. Total général	947,85				

ource : Etude Préliminaire de l'Entretien des routes en Terre, BCEOM 1977 pp. 13, 18 + 13, 21.

= y compris 332 kms de routes bitumées à 92,000/km (ineluding 332km of paved roads)

++ = y compris 50 kms/an de routes bitumées à 5.4 millions/km (including 50 km of paved roads per year)

++ = y compris 105 matériaux pour l'entretien des routes bitumées (including the materials for paved road maintenance)

Tableau 3-1
Table 3-1

TCHAD

Besoins en Investissements
Investment Requirements
(millions FCFA)

	Prix TTC (Price with taxes)	Taxes	Devises (Foreign Exch.)	Monnaie Locale (Local currency)
1. Aménagements (Improvements)				
Atelier Central	675	157	456	62
SER N'Djaména	115	27	77	11
Abeché	61	14	41	6
Moundou	118	28	79	11
Sarh	111	26	75	10
Total	1080	252	728	100
2. Pièces Detachées pour la remise en état du materiel (Spare parts to return equipment to working order)	264	104	154	6
3. Achat du Matériel (Equipment Purchase)	1145	246	899	0
4. Investissement Total (Total Investment)	2.489	602	1781	106

Source: Etude Préliminaire de l'Entretien des Routes en Terre, BCEOM, 1977, pp. 13.11-13.13.

Tableau 3-m
Table 3-m

TCHAD

Investissement Minimum en Matériel Neuf
Minimum Investment in New Equipment
(millions FCFA)

	Prix Unitaire (Unit Price)		Quantité	Coût Total (Total Cost)	
	HT(w/o tax)	TTC(with tax)		HT(w/o tax)	TTC(with tax)
Bulldozer	32,50	40,30	4	130,00	161,20
Niveleuse (Grader)	19,62	24,37	9	176,58	219,33
Chargeur (Loader)	14,18	17,58	4	56,72	70,32
Camion benne (dump truck)	8,26	10,78	15	123,90	161,70
Camion graissage (grease truck)	4,95	6,63	9	44,55	59,67
Véhicule légère (light vehicle) (Landrover)	2,20	3,10	1	2,20	3,10
Véhicule légère (light vehicle) (Peugeot 404)	1,48	2,08	10	14,80	20,80
Moto pompe	0,71	1,16	5	3,55	5,80
Tracteur agricole	4,00	5,00	2	8,00	10,00
Dumper	2,40	3,00	33	79,20	99,00
Camion benne (dump truck) (25 tonne)	3,17	4,44	17	53,89	75,48
Petit matériel (small equip.)	0,30	0,40	15	4,50	6,00
Citerne tracté (mobile tank) (5000 l. gas oil)	3.20	4,00	3	9,60	12,00
Citerne tracté (mobile tank) (2000 l. eau (water))	1,30	1,63	11	14,30	17,93
Citerne tracté (mobile tank) (10,000 l. gas oil)	4,20	5,30	4	16,80	21,20
Remorque atelier (mobile workshop trailer)	3,56	4,45	4	14,24	17,80

Tableau 3-m suite
Table 3-m continued

	Prix Unitaire (Unit Price)		Quantité	Coût Total (Total Cost)	
	HT(w/oTax)	TTC(with tax)		HT(w/oTax)	TTC(with tax)
Roulotte-bureau (office-trailer)	6,00	7,50	4	24,00	30,00
Pulvi mixer	20,00	24,80	2	40,00	49,60
TOTAL				816,81	1040,93
Estimation (+10%)				899	1145

rce: Etude Préliminaire de l'Entretien des Routes en Terre, BCEOM, 1977, p 13.13.

Tableau 3-n
Table 3-n

TCHAD

Synthese des Besoins en Personnel
Summary of Personnel Requirements

Qualification	Besoins (Needs)	Moyens Actuel (Present Resources)			
		fonct. (Admin.)	contract.	Perm.	Total
1. Ingenieur Mecanicien (mech. engineer)	1	-	-	-	-
2. Chef centre Exploit. (Chief of Operations)	4	-	-	-	-
3. Technicien mécan. (Mech. Technician)	12	-	1	-	1
4. Contremaitre (Supervisor)	10	8	-	-	8
5. Conduct. de Travaux (Work crew supervisor)	9	28		3	31
6. Chef de Secteur (Sector Chief)	15				
7. Mécanicien (Mechanic)	63	-	25	33	58
8. Ouvrier Qualifié (Skilled workers)	54	-	27	14	41
9. Aide-Ouvrier (Workers aide)	76	-	7	55	62
10. Chauffeur (Driver)	58	-	5	57	62
11. Cond. d'engins (Equipment Driver)	50	-	11	38	49
12. Aide conducteur (Drivers aide)	22	-	-	2	2

Source: Etude Preliminaire de l'Entretien des Routes en Terre, BCEOM, 1977, p.11.11.

Table 2-0

T C H A D

BUDGET DE FONCTIONNEMENT DU PROGRAMME MINIMUM 1977-1982
MINIMUM PROGRAM OPERATING BUDGET 1977-1982
(millions FCFA)
Année (Year)

	1977	1978	1979	1980	1981	1982
1. Budget de Fonctionnement Minimum						
a) Entretien Courant et périod.* (periodic and Routine Maint.)	200	330	460	600	740	882
b) Rehabilitation*	-	30	30	30	20	---
c) Amortissement (Depreciation)	54	89	124	162	200	238
Total (FCFA constant)	254	449	614	792	960	1120
Facteur d'inflation (inflation factor)	1.0	1.10	1.21	1.33	1.46	1.61
Total (FCFA courant)	254	494	743	1053	1402	1803
2. Participation Extérieure (Foreign Financing)						
a) 45 % entretien (devises) maint. (Foreign currency)	90	149	207	270	333	397
b) 50 % Amortissement	27	45	62	60	100	119
c) 79 % deréhabilitation	---	24	24	24	16	---
Total (FCFA constant)	117	218	293	375	449	516
Total (FCFA courant) (inflated FCFA)	117	240	355	499	656	831
3. Budget Réel Minimum (True Minimum Budget)	164	254	388	554	906	972

* Sans amortissement mais TTC (without depreciation but with taxes)

Tableau 3-p
Table 3-p

TCHAD

Programme Minimum d'Investissement 1977-1982
Minimum Program Investments 1977-1982
(millions FCFA)

	Annee (Year)						
	1977	1978	1979	1980	1981	1982	TOTAL
1. Pièce detachées d'urgence (priority spare parts)	160	-	-	-	-	-	160
2. Matériel (Equipment)	899	-	-	-	-	-	899
3. Assistance Technique*	244	244	244	44	44	44	864
TOTAL HT (without tax) (FCFA Constant)	1303	244	244	44	44	44	1923
a) Devises (foreign currency)	1260	207	207	37	37	37	1785
b) Monnaie locale (local currency)	43	37	37	7	7	7	138

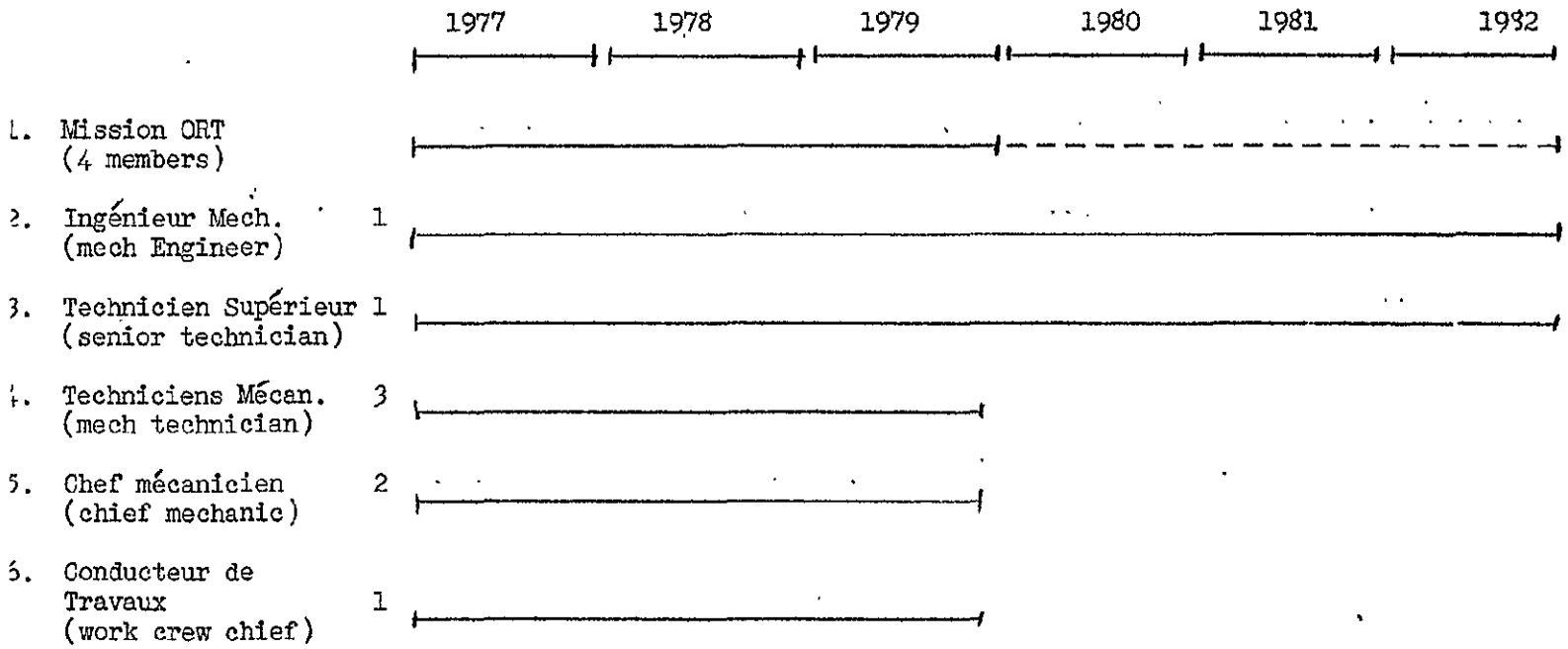
Source: Etude Préliminaire de l'Entretien des Routes en Terre, BCEOM, 1977, pp. 13.11-13.15.

* y compris la prolongation de la mission O.R.T. actuelle.
(including extension of the present ORT team.)

Graphique 3- b
Figure 3- b

TCHAD

Calendrier de l'Assistance Technique Proposée 1977 - 1982
Schedule of Proposed Technical Assistance



4

THE GAMBIA

4.1 Summary

The present Gambian road network totals 2970 kms, of which 832 kms [illegible] has been taken in charge [illegible] by the Public Works Department for maintenance. In executing this maintenance responsibility, the PWD is severely constrained by lack of financial, equipment and manpower resources. The present budget is roughly a tenth of the level which must be attained to meet minimum program requirements (including rehabilitation) by 1982/83.

The urgent needs and the actions which should be immediately taken in The Gambia are the following:

		Estimates (MD)
a)	Rehabilitation works	40.7
b)	Equipment and spare parts	3.0
c)	Technical assistance	1.2
d)	Construction of workshop and tooling	1.2
		46.1 MD

This proposed program includes:

- the maintenance of 1210 kms of roads, and
- the rehabilitation of 490 kms.

4.2 Road Network and Traffic

4.2.1 Road network and traffic 1977

The Gambian road network has not yet been officially classified. But the Gambian Public Works Department (P.W.D.), Ministry of Works and Communications, has adopted an unofficial classification which is being used in the present report and totals 832 kms

out of an estimated network total of 2970 kms. The network is made up of bituminous roads, gravel roads, and all weather and dry weather earth roads.

The P.W.D. has undertaken for many years bi-annual traffic counts for the country and monthly counts for the Serrakunda Banjul Highway (interurban road). However, the results have never been analysed and P.W.D. officials are doubtful about their reliability. As a result, no traffic data could be included in this report. Table 4-a summarizes the 1977 situation.

4.2.2 Road network and traffic 1982

Based upon discussions with P.W.D. officials and taking into account planned upgrading and paving of parts of the primary road network, the rehabilitation of other primary roads, secondary roads and feeder roads, the development of the road network from 1977 to 1982 was projected. Table 4-b summarizes the 1982 situation.

4.3 Present Maintenance

4.3.1 Organization

Road maintenance is the responsibility of the Public Works Department, Ministry of Works and Communications, for paved and gravel (improved earth) roads, and the responsibility of the Ministry of Local Government for the remainder of the network. Table 4-c shows the P.W.D. organization charts.

The maintenance is carried out by the Engineering Branch of P.W.D. through its three regional divisions. Equipment maintenance falls under the responsibility of the Transport Branch which runs the central workshop.

4.3.2 Workshop and equipment

Gambian equipment management is seriously impaired by three major problems: an inadequate, rundown central workshop; worn out and obsolete tooling; and an operating system lacking in supervision, planning and controls.

The central workshop is housed in an old hangar ill-suited for the PWD's present needs. Due to the physical state of the building and a disorganized interior layout, working conditions and spare parts storage are a serious problem. Much of the shop's tooling is over twenty years old and worn out. Required tolerances can no longer be achieved.

Preventive maintenance is not practiced and equipment tends to be operated until a breakdown deadlines it. Lack of procurement and inventory control systems exacerbate this repair problem, which is already difficult due to the tooling situation referred to above. Further, the present condition of individual units is not known--all units are reported serviceable, while a cursory examination makes it readily apparent that this is not the case.

The equipment fleet is aged and of varied origins. 65% of heavy equipment is more than ten years old. Equipment is the antithesis of standardization with more than seven countries and up to eight different makes/countries represented. An order for new equipment has been prepared with UN assistance, but it will itself engender some problems.

There is a severe shortage of qualified mechanics.

4.3.3 Present maintenance levels

The P.W.D. is responsible for 832 kilometers of roads--304 kms paved and 528 kms unpaved. Although P.W.D. officials report that the entire is being maintained, it was not possible to establish at what level. Budgetary constraints suggest that the actual maintenance levels may be significantly below P.W.D. objectives.

4.3.4 Budget and constraints

The P.W.D budget has changed little in recent years--its 1976-1977 level is approximately D500,000.* This is far below the needs for minimum maintenance. The budget is allocated by P.W.D. to the three regional engineers who are responsible for the maintenance by force account and/or by petty contractors. The Ministry of Local Government receives D150,000 for the remainder of the network.

4.4 Unit Costs

Maintenance unit costs were derived from the Consultant's experience in Senegal (Etude d'Entretien Routier, Senegal, LBII, 1971), recent price increases and the Gambia Rural Roads Study (ECA, Nov. 1976). Table 4-d summarizes the results on a per km basis.

For rehabilitation works, ECA costs were used. For the Laminkoto-Fatota road, not included in ECA study, ECA average costs were applied. For Kiand West and Bumiadu-Kuntair Roads, P.W.D. estimates were used. All of these are contractors' prices.

The foreign exchange component was calculated at 70% of the contractor's costs, in line with the ECA study estimates.

---

* This compares with a 1975/76 budget allocation for roads and bridges of D550,000 and a 1972/73 allocation of D540,000. However, the Consultant's analysis of recent budget documents indicates that including overheads, the actual resources allocated to maintenance may be in excess of D1.0 million.

4.5 Rehabilitation Requirements

Rehabilitation requirements are based upon the urgent needs to

1) improve the main arteries, primary and secondary roads to all-weather standard; and,
2) improve the feeder road network in order to connect productive agricultural regions with main roads or the Gambia River.

The links to be rehabilitated under this minimum program total 490 kms.

In its modernization program for the period ending 1982, the Gambian Government plans to upgrade part of the main road network; specifically:

1) pave Soma - Basse Road (200 kms);
2) pave Essau - Kerawan Road (55 kms);
3) improve Kerawan - Laminkoto Road (171 kms).

These proposed projects go beyond "rehabilitation" as defined in the present study and therefore have not been included in the program recommended by the Consultant.

Table 4- summarizes the rehabilitation requirements.

4.6 Maintenance Requirements

A vicious circle of insufficient funds, lack of qualified personnel and lack of equipment in good running condition renders present maintenance efforts extremely inadequate. The Consultant recommends the immediate initiation of five urgent actions:

a) Purchase of necessary spare parts for the repair of those equipment units which still have a useful life;
b) New equipment will have to be purchased to replace that which has been or should be junked;
c) Construction of and tooling for a new central workshop;
d) provision of technical assistance to fill gaps in upper level staff positions, provide on-the-job counterpart training,

and assist P.W.D. to plan, organize and execute maintenance budget and programs; and

e) Formulation and start-up of coherent training programs for engineers and technicians both in Gambia and overseas.

4.7 Minimum Recommended Program 1977-1982

4.7.1 Operating budget

Budget appropriations must cover the expenditures for routine and periodic maintenance and rehabilitation. Table 4-h summarizes the minimum budget requirements (including rehabilitation), which are forecast at 14 MD in 1982/83, compared to 8 MD in 1978/79. In contrast, the 1977/78 budget is almost insignificant. The recommended budget takes a sudden jump in 1978/79, the year in which minimum maintenance costs are first applied. The forecast progresses linearly from 1978/79 to 1982/83. This budget provides for the maintenance of 1210 kms of earth and paved roads. The ability of the P.W.D. to absorb the forecast increases is a separate question which will be taken up in the Final Report.

4.7.2 Investments

Table 4-n summarizes the proposed investment program. The program includes:

a) the minimum requirements recommended for the period 1977-1982;

b) the immediate needs during 1977-1979.

The minimum program comes to 73 MD (US$ 31 M), and the immediate program to 24 MD (US$ 10 M).

The program is subdivided into:

- contract works	40.7 MD
- technical assistance	1.2 "
- equipment and spare parts	3.0 "
- workshop construction and tooling	1.2 "
TOTAL	46.1 MD

4.8 Technical Assistance

Table 4-o summarizes the technical assistance requirements. The Consultant recommends an initial provision of 72 person-months of technical assistance to aid the Gambian Department of Public Works in the planning, organization and implementation of the minimum maintenance program. The cost of this element is estimated at 1.2 million Dalasi.

Tableau 4-a
Table 4-a

THE GAMBIA

Situation du Reseau Routier en 1977 (kms)
Road Network as of 1977 (kms)

Classement (Classification)	Type de Routes - (Road Type)				Total
	Bitumees (Paved)	Routes en Terre - (Earth Rd.)			
		Ameliorees (Improved)	Ordinaires (All weather)	Seasonnier (Dry weather)	
Routes Principales (Primary Roads)	277	425	-	174	876
Routes Secondaires (Secondary Roads)	27	103	-	-	130
Routes Economiques (Feeder Roads)	-	-	1696	258	1954
Total par Type (Total by Type)	304	528	1696	258	1954
Affecte au D.T.P. (P.W.D. Responsibility)	304	528	-	-	832
Entretenu (Maintained)	304	528	-	-	832
% du Reseau Total % of Total Network)	10%	18%	-	-	28%

Sources: Equetes aupres du Directeur Adjoint des Travaux Publics
(Interviews with P.W.D. Deputy Director)

Tableau 4-b
Table 4-b

THE GAMBIA

Situation du Reseau Routier en 1982 (kms)
Road Network as of 1982 (kms)

Classement (Classification)	Type de Routes - (Road Type)				Total
	Bitumees (Paved)	Routes en Terre - (Earth Rd.)			
		Ameliorees (Improved)	Ordinaires (All weather)	Seasonnieres (Dry weather)	
Routes Principales (Primary Roads)	703	173	-	-	876
Routes Secondaires (Secondary Roads)	27	103	-	-	130
Routes Economiques (Feeder Roads)	-	204	1492	258	1954
Total par type (Total by Type)	730	480	1492	258	2960
Affecte au D.T.P. (P.W.D. Responsibility	730	480	-	-	1210
Entretenu (Maintained)	730	480	-	-	1210
% du Reseau Total (% of Total Network)	25%	16%	-	-	41%

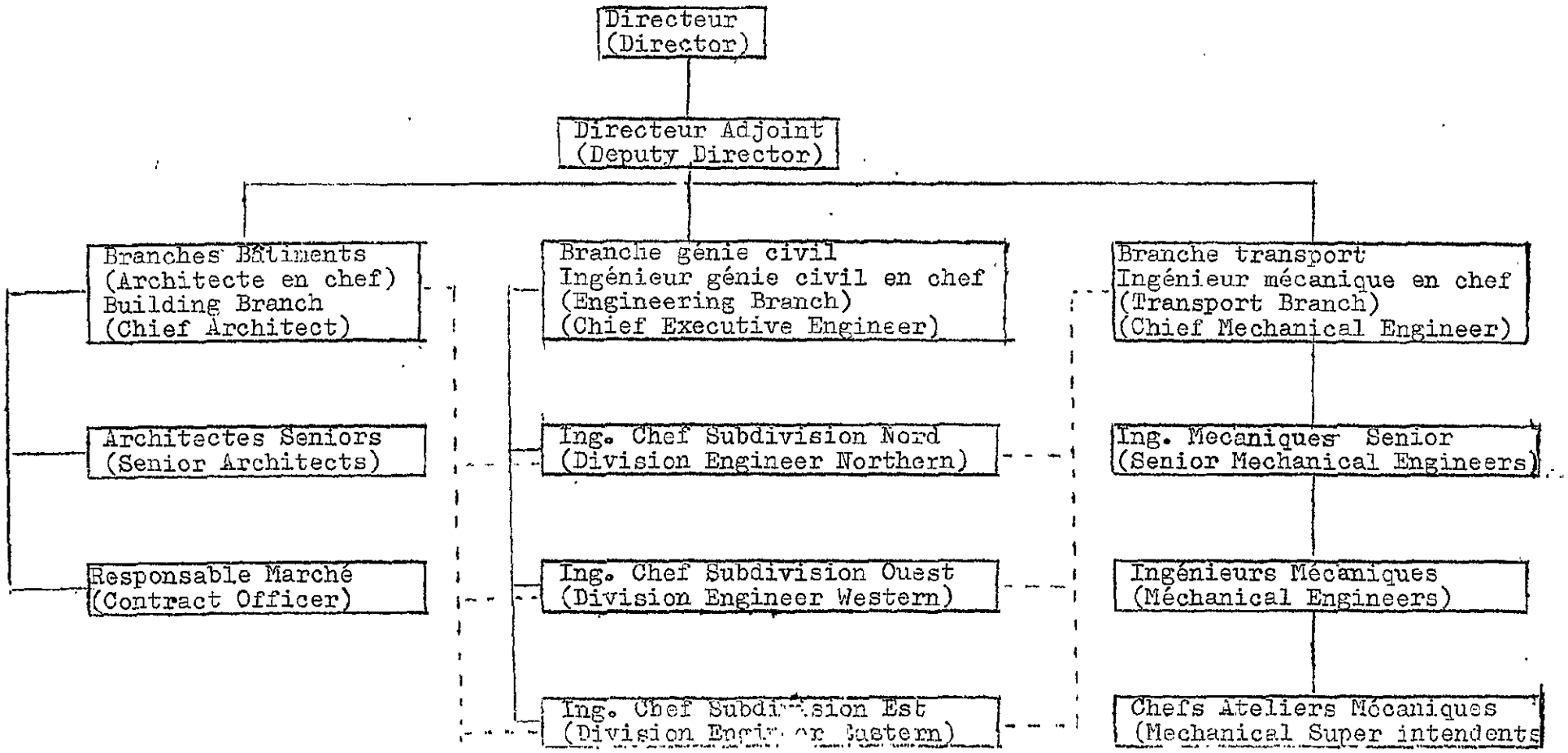
Sources: Enquetes aupres du Directeur Adjoint des T.P.
(Interviews with P.W.D. Deputy Director)

Table 4-c

THE GAMBIA

ORGANIGRAMME DU DEPARTEMENT DES TRAVAUX PUBLICS
(ORGANIZATION CHART OF PUBLIC WORKS DEPARTMENT)

BEST AVAILABLE



BEST AVAILABLE

Tableau 4-d
Table 4-d

THE GAMBIA

Prix Unitaires d'Entretien Minimum
Unit Prices for Minimum Maintenance

	Cout Annuel/Km (Annual Cost/Km) (Dalasi)
1. Routes Bitumees (Paved Roads)	
a) Entretien Courant* (Routine Maintenance)	1,440
b) Revetement (1/10 ans) (Resurfacing)	1,480
TOTAL	2,920
2. Routes en Terre Ameliorees (Improved Roads)	
a) Entretien Courant* (Routine Maintenance)	790
b) Rechargement (1/10 ans) (Resurfacing)	2.080
TOTAL	2.870

* y compris cantonnage, point a temps et curage des fosses.
(Including cantonnage, patching and cleaning ditches.)

Source: Gambia Rural Roads Study, ECA, Nov. 1976.
Etude d'Entretien Routien, Senegal, LBI, 1971.

Tableau 4-e
Table 4-e

BEST AVAILABLE

THE GAMBIA

Besoins en Rehabilitation
(Rehabilitation Requirements)
(M Dalasis)

Routes (Names of Roads)	Classe	Long. (Length) kms.	Estimation (Cost)* TTC. (W. Taxes)	Devises (For. Ex.)	Notes
Laminkoto-Fatoto	PR	135	7,8	5,5	Prix moyen C (Avg.ECA pri
Fatoto-Basse	"	39	2,6	1,8	Rapport CEA (ECA Report)
Sokuta-Jambamjali	SR	15	0,4	0,3	"
Jambamjali-Gunjur	"	11	1,1	0,8	"
Gunjur-Kartun	"	10	0,24	0,17	"
Brikama-Gunjur	"	17	0,64	0,45	"
Kerawan-N'Jawara	FR	10	0,58	0,41	"
Banni-Salikene-N'Jabakunda	"	16	0,92	0,64	"
[illegible]-Balingho	"	11	0,68	0,48	"
Sippak[illegible]-Bambali	"	20	1,25	0,88	"
Ngeyen-Sanjal-Sarakunda	"	8	0,46	0,32	"
Soma-Sankwia-Tenda	"	6	0,68	0,48	"
Kwinelli-Tendaba	"	5	0,36	0,25	"
Choya-Dankunku-Jessadi	"	20	1,11	0,78	"
Sotuma-Gambissara	"	7	0,46	0,32	"
Kundam-Kulari-Sajakunda	"	17	1,00	0,70	"
Kiang West Roads	"	87	12,4	8,7	CEE (EEC)
Kuniadu-Kuntair	"	56	8,0	5,6	"
TOTAL		490	40,7	28,5	

Notes 1. PR : Routes Principales (Primary Roads
SR : Routes Secondaires (Secondary Roads)
FR : Routes Economiques (Feeder Roads)

2. Sources: Gambia Rural Road Study, ECA, Nov. 1976
Director Adjoint des T.P.

Tableau 4-f
Table 4-f

THE GAMBIA

Budget Minimum de Fonctionnement (1978)
(Proposed Minimum Operating Budget)

	Longueur (Length)	Cout/km (Cost/km)	Cout Total (Total Cost)	Amort. (Depr.)	Pieces Det. (Spare)	Carb.-Huile (Fuel-Oil)*	M.O. (Labor)
	(km)	(Dalasis)	(M Dalasis)				
1. Entretien Courant (Routine Maintenance)							
a) Routes Bitumees (Paved Rds)	304	1.440	0,44	0,11	0,09	0,10	0,14
b) Routes Ameliorees (Improved Roads)	528	790	0,42	0,11	0,09	0,09	0,13
TOTAL	832		0,86	0,22	0,18	0,19	0,27
2. Entretien Periodique (Periodic Maintenance)							
a) Routes Bitumees (Paved Rds)	304	1,480	0,45	0,02	0,02	0,38	0,03
b) Routes Ameliorees (Improved Roads)	528	2.080	1,10	0,31	0,29	0,22	0,28
TOTAL	832		1,55	0,33	0,31	0,60	0,3[illegible]
3. Entretien Total (Total Maintenance)			2,41	0,55	0,49	0,79	0,58
4. Frais Generaux 15% (overhead)			0,36	0,08	0,07	0,12	0,09
5. Totaux Generaux (Grand Total)			2,77	0,63	0,56	0,91	0,67

Tableau 4-f (suite)
Table 4-f (continued)

* y compris les couts des materiaux (including materials)

1. 25% Amort. (depr.), 21% pieces det. (spares), 22% carb. (fuel), 32% M.O. (labor)

2. 5% Amort. " , 5% " " " , 85% " " , 5% " (labor)

3. 28% Amort. " , 26% " " " , 20% " " , 26% " (labor)

<u>Note</u>: Les longueurs entretenues sont consideres inchangees entre 1977-1978. (Kms maintained are considered unchanged from 1977-1978.)

Tableau 4-g
Table 4-g

THE GAMBIA

BUDGET MINIMUM DE FONCTIONNEMENT
PROPOSED MINIMUM OPERATING BUDGET (1982)

	longueur (length)	Coût/km (cost/km)	Coût total (Total cost)	Amort. (Depr.)	Pièces dét. (spore ports)	Carb.-huile (fuel-oil)*	Main d'œ (labor)
1. Entretien Courant[1] (Routine Maint.)	(km)	(Dalasi)	(M. Dalasi)				
a) Routes bitumées (paved roads)	730	1440	1,51	0,37	0,31	0,33	0,50
b) Routes améliorées (improved raods)	480	790	0,38	0,10	0,08	0,08	0,12
TOTAL	1210		1,89	0,47	0,39	0,41	0,62
2. Entretien périodique							
a) routes bitumées 2 (paved roads)	730	1480	1,08	0,05	0,06	0,92	0,06
b) routes améliorées 3 (improved roads)	480	2080	1,00	0,28	0,26	0,20	0,26
TOTAL	1210		2,08	0,33	0,32	1,12	0,32
3. Entretien total (total maint.)			3,97	0,80	0,71	1,53	0,94
4. Frais généraux (over heads) 15 %			0,60	0,12	0,11	0,23	0,14
5. Totaux généraux (grand total)			4,57	0,92	0,82	1,76	1,08

*Y compris les coûts des matériaux
1) 25 % Amort., 21 % pièces détachées, 22 % carb. 32 % M.O.
2) 5 % Amort., 5 % pièces détachées, 85 % matériaux et carb. 5 % M.O.
3) 28 % Amort., 26 % pièces détachées, 20 % carb. 26 % M.O.

Tableau 4-h
Table 4-h

THE GAMBIA

Proposition d'Evolution du Budget Minimum
Forecast Minimum Budget Requirements (1977-1982)
(en millions Dalasis)

	1977	1978	1979	1980	1081	1982
A) Budget Minimum Total						
Entretien courant et périodique (Routine and periodic maintenance)	0,58[a]	2,77	3,22	3,67	4,12	4,57
Rehabilitation	-	4,70	9,00	9,00	9,00	9,00
Amortissemont (Deprec.)	-	0,63	0,70	0,78	0,85	0,92
Total - Dalasis Constant (in constant price 1977)	0,58	8,10	12,92	13,45	13,97	14,49
Actualisé 10% an (Inflated) coef.=	1,0	1,10	1,21	1,33	1,46	1,61
Total actualise (infl.)	0,58	8,91	15,63	17,89	20,40	23,33
B) Participation Exterieure (Foreign Financing)						
Fonds divers-80% reh. (Various Funds)	-	3,76	7,20	7,20	7,20	7,20
Actualisé 10% l'an (Inflated)	-	4,14	8,71	9,58	10,51	11,59
Budget Réel Minimum (True Minimum Budget)	0,58	4,77	6,92	8,31	9,89	11,74

(a) Budget insuffisant (inadequate budget)

Notes: La progression des coûts d'entretion est considerée comme linéaire. (Assume a linear progression of maintenance costs.)

Tableau 4-i
Table 4-i

THE GAMBIA

Besoins en Equipe d'Entretien en 1977
(Maintenance Crew Requirements 1977)

	(1) Longueur (Length) Kms	(2) Frequence (Frequencies)	(3) Total Kms (Kms Total) (2) X (1)	(4) Rendemont (Prod. Rate)	(5) Jours Travail (Days Needed) (3) ÷ (4)	(6) No. Equipes (No. Crews) (5) ÷ 200
Entretien Courant (Routine Maint.)						
a) Routes Bitumées (Paved)	304	2/ans	608	4 kms/j	152	0,76
b) Routes Améliorées (Improved Unpaved)	528	2/ans	1056	5 km/j	211	1,1
TOTAL					363	1,86
Entretien Periodique (Periodic Maint.)			(1) ÷ (2)			
a) Routes Bitumées (Paved)	304	10 ans	30	1 km/j	30	0,15
b) Routes Améliorées (Improved Unpaved)	528	10 ans	53	0,3 km/j	177	0,89
TOTAL					207	1,04

Sources: Gambia Rural Roads Study, ECA, Nov. 1976
Etude d'Entretien Routier, Sénégal, LBII, 1971

Tableau 4 - j
Table 4 - j

THE GAMBIA

BESOINS EN EQUIPES ENTRETIEN EN 1982
(MAINTENANCE CREW REQUIREMENTS)

	(1) Longueur (Lenght) kms	(2) Frequence (Frequencies)	(3) Total kms (kms total) (2)x(1)	(4) Rendement (Prod-Rate)	(5) ours Travail (days needed) (3) ÷ (4)	(6) No. Equipes No. Units (5) ÷ 200
n Courant Maint.)						
outes bitumées aved)	730	2/an	1460	4km/jour	365	1,8
outes améliorees Improved unp.)	480	2/an	960	5km/jour	192	1,0
					557	2,8
n Périodique c Maint)			(1) ÷ (2)			
outes bitumees eved)	730	10/ans	73	1km/jour	73	0,4
outes Ameliorees Unpaved Improv.)	480	10/ans	48	0,3km/jour	160	0,8
					233	1,2

Gambia Rural Roads Study, ECA, Nov 1976
Etude d'Entretien Routier, Senegal, LB 11 1971

Tableau 4-k
Table 4-k

THE GAMBIA

Composition des Equipes d'Entretien Courant
(Routine Maintenance Crew Composition)

Materiel (Equipment)	1978 2 equipes (Crews)	1982 3 equipes (crews)
1 Niveleuse 120 CV (grader)	2	3
1 Rouleau vibrant 2-3T (Vibration Roller)	2	3
1 Camion de servitude (Courrier Truck)	2	3
1 Camion Station Service (Fuel truck)	2	3
1 Camion Citerne 6000L (Water Tank Truck)	2	3
1 Camion Point-a-temps (Patching unit truck)	2	3
1 Trousse a outils (Tool set)	2	3
Personnel (Labor)		
1 Chef d'equipe (Superintendant)	2	3
2 Conducteurs d'engins lourds (H.E. operators)	4	6
4 Chauffeurs (Drivers)	8	12
2 Manoeuvres specialises (Skilled laborers)	4	6
10 Manoeuvres ordinaires (Ordinary laborers)	20	30

Tableau 4-1
Table 4-1

THE GAMBIA

Composition des Equipes d'Entretien Periodique
(Periodic Maintenance Crew Composition)

Materiel (Equipment)	1978 1 equipe (crew)	1982 1 equipe (crew)
1 Chargeuse 100 CV sur pneus (F.E. loader)	1	1
1 Bulldozer 180 CV (Bulldozer)	1	1
2 Niveleuses 120 CV (Motorgrader)	2	2
1 Rouleau tandem 8-10T (Smooth wheel roller)	1	1
1 Camion citerne 120001 (Water tank truck)	1	1
1 Camion station service Fuel Tank Truck)	1	1
1 Camion atelier (Mechanic Truck)	1	1
6 Camions benne $4m^3$ (Dump trucks)	6	6
1 Pick-up	1	1
1 Camion epandeur de liant (Bitumen distributor truck)	1	1
1 Camion gravillonneur (Chip spreader truck)	1	1

Tableau 4-1 (suite)
Table 4-1 (continued)

THE GAMBIA

Composition des Equipes D'Entretien Periodique
(Periodic Maintenance Crew Composition)

Personnel (Manpower)	1978 1 equipe (crew)	1982 1 equipe (crew)
1 Chef d'equipe (Superintendant)	1	1
5 Conducteurs d'engins lourds (H.E. operators)	5	5
12 Chauffeurs (Drivers)	12	12
4 Manoeuvres specialises (skilled laborers)	4	4
7 Manoeuvres ordinaires (Ordinary laborers)	7	7

Tableau 4 - m
Table 4 - m

The GAMBIA

BESOINS EN MATERIEL POUR L'ENTRETIEN

(EQUIPMENT REQUIREMENTS FOR MAINTENANCE)

MATERIEL (EQUIPMENT)	Besoins (Requirt.)		Prix unit. (Unit price) (10^3)	Coûts (Cost)	
	1978	1982		1978 (10^3)	1982 (10^3)
Niveleuse 120 CV (Grader)	4	1	145	580	580
Rouleau vibrant 2-3T (Vibration roller)	2	1	24	48	24
Camion de servitude (Courrier Truck)	2	1	40	80	40
Camion Station service (Fuel Truck)	3	1	40	120	40
Camion citerne (Water tank truck)	3	1	60	180	60
Camion point-à-temps (Patching Unit truck)	2	1	40	80	40
Camions benne (Dumpers)	6	-	50	300	-
Chargeuse 100 CV (F.E. Loader)	1	-	128	128	-
Bulldozer 180 CV	1	-	215	215	-
Rouleau tandem 8-10 T (Smooth wheel roller)	1	-	48	68	-
Camion atelier (Mechanic truck)	1	-	60	60	-
Pick-up	1	-	17	17	-
Camion épandeur de liant (Bitumer distributor truck)	1	-	75	75	-
Camion gravillonneur (Chip spreader truck)	1	-	45	45	-
Total				1.996	784

TABLEAU 4 - n

Table 4 - n

THE GAMBIA

PROPOSITION PROGRAMME D'INVESTISSEMENT

(PROPOSED INVESTMENT PROGRAMS)

(10^6 D)

	1977	1978	1979	1980	1981	1982	TOTAL
ACTIONS A FINANCER (FINANCING)							
Aménagement des ateliers et l'outillage (improvement of work sheps and tocls)	1,16	-	-	-	-	-	1,16
Achat pièces rechange (spore parts proe)	0,20	-	-	-	-	-	0,20
Assis. Technique (Technical Assis)	-	0,60	0,60	-	-	-	1,20
Entretien périodique (Périodis maint)	-	1,55	1,68	1,82	1,95	2,08	9,08
Réhabilitation	-	4,70	9,00	9,00	9,00	9,00	40,70
Achat matériel (équipment proc)	-	2,00	-	-	0,80	-	2,80
TOTAL.....	1,36	8,85	11,28	10,82	11,75	11,08	55,14
augmentation coût 10 % (inflated)	1,00	1,10	1,21	1,33	1,46	1,61	-
Minimum	1,36	9,74	13,65	14,39	17,16	17,84	74,14 ($ 31 M)
Immédiat	1,36	9,74	13,65	-	-	-	24,75 ($ 10 M)
Est. montant MD	0,95	6,81	9,56	10,07	12,01	12,49	51,89

Tableau 4 - 0
Table 4 - 0

The GAMBIA

PROGRAMME ASSISTANCE TECHNIQUE
(TECHNICAL ASSISTANCE PROGRAM)

	Durée (length) (mo.)
Ingénieur routier (Aighway engineer)	24
Spécialiste matériel (Equipment specialist)	12
Conducteurs de travaux (Maintenance superintendant)	24
Accounting specialist (specialist comptable)	12
	72 x $ 7000 =
	$ 504.000
	D 1.179.360
arrondi rounded off	D 1.200 000

Tableau 4p
Table 4p

GAMBIA

Parc Matériel Existant
Heavy Equipment Inventory

Etat et/ou âge CONDITION AND/OR AGE	Bull dozer	Niveleuses graders	chargeurs loader Shovels	Grue Cranes	Camion benne Dump Truck	Rouleau road Roller	Rouleau vibrant vibrating Roller	Concasseur crusher	Point à temps tor Sprayer	Remorque citerne water trailer	Compresseur air compr.	Shell sprayer
GOOD 75/76	1-06	2	4		3		2		4			
GOOD 2-5 YRS				1								
5-7 YRS	1-06		1		2		2					
7-10 YRS		3	2	1				- 1W	1		1	
10-15 YRS	1-06 1-951	2	2				2				1	3
15-20 YRS	1-04	4			2		3	2C-1W		1	1	1
20-25 YRS						5			1			
25				1		7		1W	14	5		
Age inconnu Unknown age								IC-1W				
TOTAL	5	11	9	3	7	12	9	3C-4W	20	6	3	4
Périmé Overage	60%	36%	22%	33%	29%	42%	33%	100% 25%	75%	83%	61%	25%

Source : J.B.BARROW Chef mécanicien, Ministère des T.P., 1977
CME - MPW

5

MALI

5.1 Summary

The Malian road network, which is approximately 14,045 km long (and of which 4,425 km are maintained), is in a relatively deteriorated state due to insufficient maintenance which, in turn, is caused by three constraints:

1) Insufficient maintenance budget (for the Roads and Bridges section, even declining in recent years) of which a large proportion (75%) is absorbed by wages and salaries.

2) Under-utilization of existing equipment (some of which is in usable condition).

3) Under-utilization of personnel.

For a minimum maintenance which would preserve the road network, two types of support to the Public Works are necessary:

1) immediately
   - -rehabilitate part of the earth road network (1,167 km)
   - -replace wearing courses
   - -maintain a supplementary part of the earth road network (about 708 km)
   - -aid in the training of present maintenance personnel

2) in the framework of a minimum program
   - -continue the rehabilitation program by taking an objective of approximately 400 km per year
   - -extend the capacity of the maintenance organization, reverse the present trend
   - -replace and increase the equipment capacities

Tables 5-i, 5-j and 5-k give an estimate of the resources needed for these actions.

5.2 Road Network and Traffic

The classified road network (ordinance #13/CMLN of 4/8/71), including agricultural tracks which have not yet been classified, as well as some roads of local interest, appear in Table 5-a.

with ranges of traffic. Its present condition is as follows:

-good condition	16%	2,245 km
-adequate condition	20%	2,810 km
-poor condition	64%	6,990 km

This network condition is a reflection of inadequate maintenance. Both the reports which were consulted and the authorities who were questioned agreed that only 21.3% of the network is relatively well maintained. For this percentage it is necessary to determine those roads which have been abandoned (from a maintenance perspective) for several years. For example, certain subdivision reports indicate 1973 as the last year for maintenance activity on certain links.

5.3 Present Maintenance - Organization - Resources - Methods

5.3.1 Organization and Personnel

Maintenance of the Malian road network, as defined above, is incumbent upon the national Public Works Directorate, which has given its actual execution to certain of its services. Those services which are most directly involved are the Roads and Bridges and the Equipment Division. (See Figure 5-c).

The total personnel who participate in road maintenance has varied in recent years between 1,400 and 1,600. On first view this number of personnel does not seem too large with respect to the length of the road network to be maintained. A rapid analysis of the personnel as a whole, as well as that of certain subdivisions, reveals, however, an excess in certain categories (drivers, typists, office boys, etc...). (See table 5-c).

5.3.2 Workshops and Equipment

In addition to the workshops of the Equipment Division (AM) which are located in Bamako, each subdivision of the Roads

and Bridges has a workshop in which it maintains and repairs equipment up to the 3rd level.

5.3.3 Present Maintenance

Present routine maintenance includes: grass mowing on shoulders, patching, ditching and cleaning of drainage structures, light and heavy reshaping estimated at:

-for paved roads	198 833	FM/km
-for earth roads	313 636	FM/km

Periodic maintenance (resurfacing of earth roads and putting down a new wearing course on paved roads):

-for earth roads	2 300 000	FM/km
-for paved roads	25 000 000	FM/km

A technique which has been proven in other places but which is no longer used in Mali is the use of the anti-washboard drog. Its use considerably reduces the cost of light and heavy reshaping.

5.3.4 Budget and Constraints

In recent years the financial resources provided to road maintenance came from three sources: national budget, Road Fund, external financing (IDA and IBRD principally).. With regard to the first sources, the available information indicates a large growth of funds in 1975 and 1976. (See tables 5-d and 5-e). But this increase has been used up in counterpart obligations, equipment replacement fund, etc...

As a result the financial resources assigned to road maintenance per se, i.e. to the subdivisions, has decreased (in constant francs) since 1971.

In these conditions, the existing equipment (despite its state of repair) cannot be used to its full capacity. Based on the provisional budget for 1977, Roads and Bridges will only attain with difficulty (according to their own calculations) an overall average of 38% of equipment capacity.

The existing equipment is therefore immobilized for a large part of the year. The maintenance personnel are thereby reduced to a type of technical unemployment.

The constraints which exist today, at the level of road maintenance in Mali, are first financial constraints (budgeting). On top of these constraints must be added those of personnel and equipment (insufficient for maintenance of the whole road network).

5.4 Unit Costs

Table 5-f shows present unit costs for certain road maintenance operations. They take into account the reduced capacity of present equipment and the reduced output that is to be expected from personnel who for several years have not had the opportunity for intensive work.

5.5 Rehabilitation Requirements

5.5.1 Immediate Requirements

They are shown in Table 5-g

5.5.2 Minimum Requirements

They relate to about 400 km of road per year (see tables 5-j and 5-k)

5.6 Maintenance Requirements

5.6.1 Immediate Requirements

They appear in Table 5-h.

5.6.2 Minimum Requirements

These appear in the form of a financial estimate in Table 5-i. They are based on the road network which will include 17,400 km by 1982, on one hand, and on the assumption that part of this network will be reconstructed or constructed with a paved surface or rehabilitated in earth, on the other hand. It is the whole of this network which is to be preserved.

5.7 Recommended Programs and Resources Required

5.7.1 Immediate Program Resources

These actions, as defined above, appear in Table 5-j. These include rehabilitation (about 1,167 km of earth roads) and periodic maintenance (708 km of earth roads and 730 km of paved roads which require new wearing courses).

The supplementary resources (about 15.8 million FM) have been identified which will permit the Malian Public Works, with its present equipment plus private contractors, to carry out the program in two years.

5.7.2 Minimum Program 1977-1982

This program includes rehabilitation, maintenance, training and replacement of equipment. It is summarized in Table 5-k. The objective of the program will be to maintain in 1982 the improved road network, or 8,455 km (50% of the total) compared with 4,425 km at present.

Several levels of action are required:

1) Supplementary financing for the operating budget. (This budget will have to increase from 981 million FM in 1977 to 3,240 million FM in 1982.)

2) Rehabilitation of approximately 400 km of earth road per year, of which 80 km (20%) by force account and the rest by contractor. The total cost of this effort comes to 29,718 million FM over six years.

3) Replacement of equipment being in principle the responsibility of a Replacement Fund, which would be supplied by the Government with help from foreign sources (e.g. IBRD).

4) Professional and practical training, whose details remain to be specified. A program complementary to the CPFP must be drawn up during the second phase of the study. In light of the paucity of work supervisors, chief mechanics and other categories of subdivision and brigade personnel, an on-the-task training program in "school-brigades" and "school-workshops" must be drawn up.

5.8 Technical Assistance

The Consultant believes that the National Directorate of Public Works has very little need of technical assistance, with the possible exception of professional training CPTP where a lack of training specialists is felt.

Tableau 5-a
Table 5-a

MALI

Situation du réseau routier en janvier 1977 (kilométres)
Road net work as of january 1977 (kilometers)
Type de Route - Road type

Classement Classification	Bitumée - paved			Terre ordinaire			Pistes améliorées (improved track)			Piste saisonnière			total par classe
	Bon	Passable	Mauvais	Bon	Passable	Mauvais	Bon	Passable	Mauvais	Bon	Passable	Mauvais	
Routes nationales National roads		1295	206	548	260	353	60	289	727	378	250	1266	5 632
Routes régionales Regional roads	35	57	5	86	226	231	169	90	677	60	602	3357	5 595
Routes locales Local roads	9								40		20	1644	1 713
Pistes non classées Improved track	45	11					1049						1 105
Totaux par type Totals by type		1 663			1 704			3 101			7 577		14 045
Entretenu Maintained (% du type)		1 135 (68 %)			1 413 (83 %)			1 146 (37 %)			1 278 (17 %)		4 972 (35 %)
% sur total du réseau % network total		8 %			12 %			22 %			54 %		100 %
Trafic 10		78			78			1 567			3 073		
10 - 30		263			1 238			774			4 334		
30 - 60		125			-			349					
60 - 100		115			363			411					
100 - 200		1 071			25								
300 - 400		-			-								
400		-			-						170		

Tableau 5 - b
Table 5 - b

M A L I

Situation du Reseau Routier En 1982 (kilometres)
Road Network As Of 1982 (kilometers)

Classement classification	Bitunees Paved	Terre ordinaire Ord. earth	Piste amelio-ree Improv.Track	Piste saison. Exist. track	Total par classe Total by class
Routes Nat'l Nat'l roads	2611	1868	100	1199	5778
Routes Regionale Regional roads	587	784	846	3528	5745
Routes locales Local roads	423	-	3888	1548	5859
Totaux par type Totals by type	3621	2652	4834	6275	17382
Affecte Govt Resp					
% sur reseau total of network total	20,83	15,26	27,81	36,10	
Trafic					
< 10	1011	101	3888	4147	
10 - 30	793	782	745	1795	
30 - 60	185	320	100	163	
60 - 100	443	825		170	
100 - 200	127	391			
200 - 400	631	233			
> 400	431				

Schéma 5-C
Figure 5-C

M A L I

ORGANIGRAMME GENERAL DE LA DIRECTION NATIONALE DES TRAVAUX PUBLICS

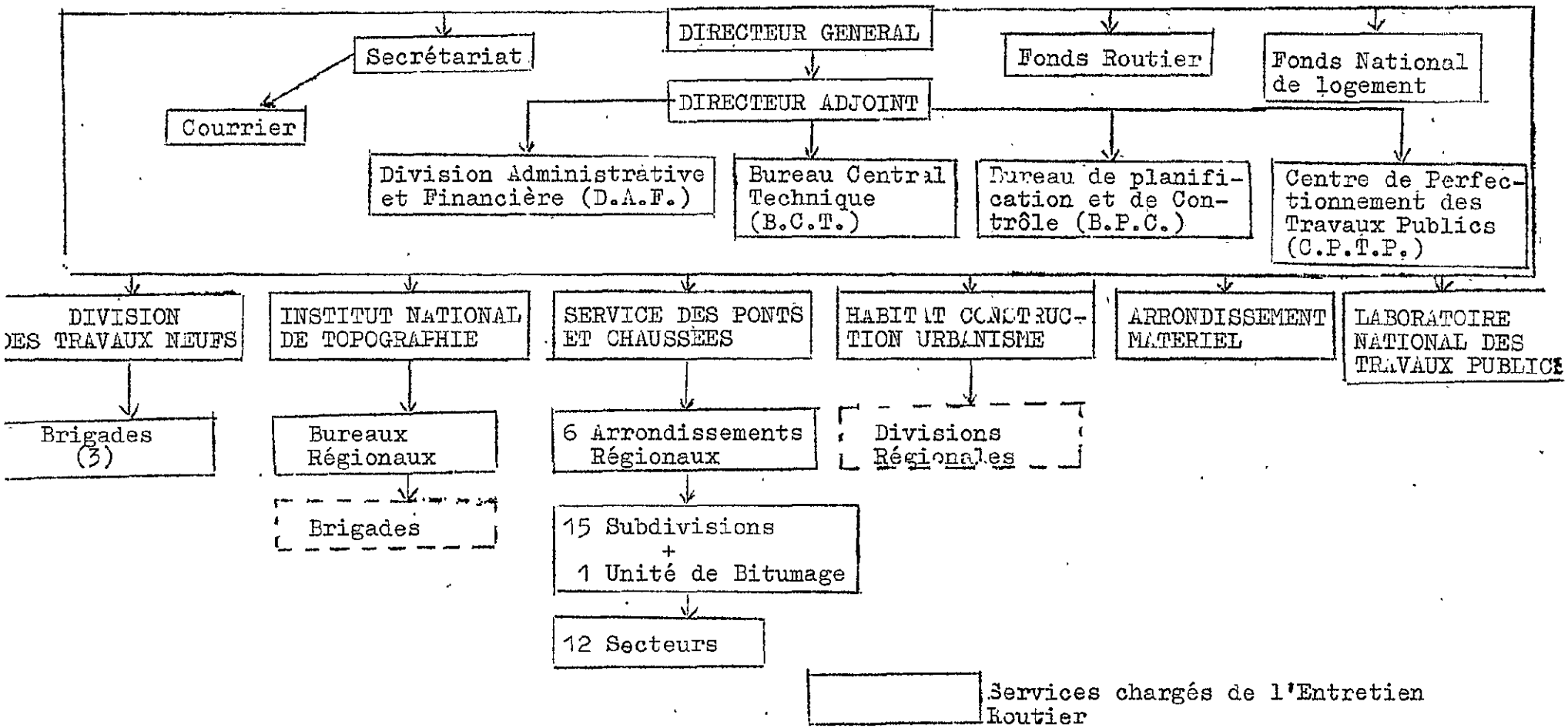


Tableau 5-c
Table 5-c

MALI

PERSONNEL ACTUEL DE L'ENTRETIEN ROUTIER (1976)
PRESENT PERSONNEL FOR ROAD MAINTENANCE (1976)

Désignation Category	Cadres	Division-naires supervisors	Permanents	Temporaires	Total
Ouvriers spécialisés	17	8	110	19	154
Ingénieur	26				26
Technicien	15	1			16
Chef de garage	8	2	2		12
Adjoint chef garage	5	1			6
Chef secteur	29	2	3		34
Chef d'équipe	4	5	39		48
Chef de station			1		1
Chef bitumeur	1		2		3
Contre-maître	3				3
Régisseur	2				2
Dessinateur			2		2
Agent labo		2			2
Agent administratif	4	11	102	2	119
Magasinier	1	1	18		20
Aide magasinier		1	11		12
Mécanicien	14	4	59		77
Aide mécanicien		1	35		36
Electriciens et menuisiers	16	6	37		59
Conducteur	3	2	88		93
Aide conducteur			15		15
Chauffeur	9	8	189		206
Gardien, planton, autres		26	436	77	539
Grand TOTAL	157	81	1 149	98	1 485

Tableau 5-d
Table 5-d

MALI

Evolution des Depenses et du Financement Routier
Highway Expenditure & Financing: 1970-1976
(millions of MF)

	1970	1971	1972	1973	1974	1975	1976
1. Expenditure-Depenses	2,231	3,431	6,100	3,159	4,363		
Budget de Fonctionnement							
1.1 Current Expenditure	778	697	906	1,123	1,343	1,984	?
entretien routier							
road maintenance	636	540	730	914	1,118	1,734	?
administration	142	157	176	209	225	250	?
Investissements							
1.2 Investment Expenditure	1,453	2,734	5,194	2,036	3,020		
2. Financing-Financement	2,231	3,431	6,100	1,123	1,343		
Sources Nationales							
2.1 National Sources	1,300	1,557	2,097	2,202	1,995	2,341	2,685
fondaroutier							
road fund	1,158	1,400	1,921	1,993	1,770	2,097*	2,410
investissement							
(investment)	(380)	(526)	(856)	(900)	(182)	(84)	(260)
Other	142	157	176	209	225	250*	275**
2.2 External Source	931	1,874	4,003	957	2,368		

* Recettes actuellas 15.9.76
Receipts as of Sept. 15, 1976

** Estime sur la base de recettes jusqu au 15.9.76
Estimated from 8½ months' receipts

Tableau 5-e[1]

Table 5-e[1]

MALI

Evolution du Fonds Routier 1970-1977
Development of the Road Fund " "
(en millions de FM)

Année Year	Recettes Receipts
1970	1.158
1971	1.400
1972	1.921
1973	1.993
1974	1.770
1975*	2.091
1976*	2.010[1]
1977*	3.655[1]

* Source: Direction National des Travaux Publics, 1977.

[1] Prévisions - forecasts

Tableau 5-f
Table 5-f

M A L I

COUTS UNITAIRES (au kilomètre)
UNIT COSTS (by kilomètre)

Désignation Opération	Type de Route - Road Type			
	Bitumée Paved	Terre Ordinaire-Ordinary Earth	Piste améliorée Improved Track	Piste Saisonnière Track
DESHERBAGE DES ACCOTEMENT	49.600	15.100	24.800	15.100
POINT A TEMPS Patching	64.800	-	-	-
REPROFILAGE LEGER Light Grading	-	18.365	18.365	18.365
REPROFILAGE LOURD Heavy Grading	-	124.963	124.963	124.963
RECHARGEMENT Graveling/Resurfacing	-	2.320.000*	1.550.000	-
RENOUVELLEMENT DE COUCHE DE ROULEMENT Resurfacing	18.000.000	-	-	-
REPROFILAGE DE FOSSES Reshaping Ditches	52.865	52.865	33.834	33.834

*Hypothèse : 1200 m3/km

Tableau 5-g
Table 5-g

MALI

BESOINS EN REHABILITATION
REHABILITATION REQUIREMENTS

Désignation Route Name of road	classe-ment classification	longueur (km) length	classe trafic moyen v/j ADT	Estimation 10^6 FM TTC w/th taxe	HT w/o taxe	devise foreign	Notes
NAME - KAYES	RN 1	106	10 - 30	1138,5	853,87	683,1	
MAHINA-SATADOU-GOU	RN 2	178	10	1911,8	1433,86	1147,08	
BAMAKO-KOUREMALE	RN 5	122	80	1310,35	982,76	786,21	
BOUGOUNI-GUELENEKOURO	RN 8	113	30	1213,68	910,26	728,21	
BOUGOUNI-MANANKORO	RN 9	123	20	1321,09	990,82	792,65	
SIKASSO-HAUTE VOLTA	RN10	44	10	472,58	354,44	283,55	Comptage routiers non effectués en 1976
NIORO-TAOTOMO	RN 3	269	10	2889,21	2166,91	1733,53	
GAO-LABBEZANGA	RN17	212	10	2277,-	1707,75	1366,2	
TOTAL		1 167		12534,21	9400,67	7520,53	

Nota : a) l'estimation des coûts est basée sur les conditions économiques connues au 1er janvier 1977

b) les travaux sont supposés réalisés à l'Entreprise, compte tenu des capacités actuelles des Travaux Publics

c) les routes sont classées en deux urgences : première = RN1, RN2, RN5, RN8

deuxième = RN9, RN10, RN3, RN17

d) le coût HT a été prix égal à 0,75 TTC

e) la part en devises étrangères a été estimée à 0,60 TTC

Tableau 5-h
Table 5-h

MALI

BESOINS EN ENTRETIEN
MAINTENANCE REQUIREMENTS

Désignation Project name	classe-ment classification	longueur (km) length	classe de trafic	Estimation 10^6 F.M. TTC w/taxe	HT w/0 tax	Devises Foreign Exch.	Réf
Frais fonctionnement matériel				2 505,25	1 503,15	1503,15	
Formation du personnel		-		150	112,5	90	
Entretien périodique routes bitumées Periodique maintenance on paved roads							
SEGOU - MOPTI	RN6	401	100-150	10025	7518,75	6015	
BOUGOUNI - ZEGOUA	RN7	306	100-150	7650	5737,5	4 590	
BAMAKO - KOULIKORO	RN14	23	200-250	575	431,25	345	
	TOTAL	730		20905,25	15303,15	12198,15	

Nota : a) les frais de fonctionnement du matériel comporte : pièces détachées, carburant et ingrédients, amortissement HT 0,60TTC, devises = 0,60 TTC

b) pour la formation du personnel HT = 0,75 TTC, devises 0,60 TTC

c) les coûts sont basés sur les conditions économiques prévalent au 1er janvier 1977

Tableau 5-i
Table 5-i

MALI

Proposition Budget Minimum d'Entretien
Proposed Minimum Maintenance Budget
(en millions de F.M. base 1977 - in millions of F.M.)

	Nb N	Total/an Annual Total	M.O. (Autre que D.M.) Personnel (Except for M.D.)	Fonct. Mat y/c Amortist. Equipment Operation Including Deprec.	Fonct. Bureaux Ateliers Magazins Office, Shop & Stores op. costs	Materiaux Materials	Notes
Section Entretien Routier - Road Maintenance	1	66,634*	5,414*	12,734*	53,900*		EC.Rel.
Subdivisions	15	242,263	97,45	47,75	101,063		EC
Secteurs Rte en T/earth r)	12	35,327	11,13	25,197			EC
Rte Bitumee - paved road	2	8,332	2,782	5,50	-		EC
Lutte Anti Tole Anti-corrug.	15	337,2	42,00	295,2	-		EC
Point A Temps Bitume - asphalt patch.	4	231,48	10,00	101,48	-	120*	EC
Groupe Lour Entretien*** **Heavy maint. group	4	1394,8	56,00	1338,8	-		Rehab.
Entretien Accot Route bitumine - shoulder maint. paved rds.	2	17,88	4,44	13,44	-		EC**
Bacs - Ferries	2	19,52	4,88	14,64	-		EC
Reprofilage - Reshaping.	8	870,4	44,16	826,24	-		EC
Direction et Services Fonctionnement - Directorate & Services Corp.		19,326	1,093	2,547	15,686		
TOTAL		3243,161	239,349	2683,588	170,649	120	
Arrondi a Round Total		3243,5 =	239,5 +	2684 +	171 +	120	

* Source : Entretien des routes au Mali 1975

* Source : Budget Prévisionnel Entretien Routier au Mali 1977 (Pet.Ch)

*** Travaux en régie

** Entretien courant - current maintenance ** Y compris

Tableau 5-j
Table 5-j

Proposition D'Exouition du Budget Minimum
Forecast Minimum Budget Requirement (1977-1982)

(en millions de F.M. in millions of F.M.)

	1977	1978	1979	1980	1981	1982
A) Budger Minimum Total						
Entretien courant et periodiqe Routine and periodic maintenance	9937	9937	1136	1296	1440	1584
Rehabilitation (+)	6267,10	6267,10	4296,2	4296,2	4296,2	4296,2
Amortinement Depreciation	440	440	464	504	560	616
En F.M. Constant in constant prices since 1977	16647,10	15547,10	5896,2	6096,2	6296,2	6496,2
Augnentation cout k 10%/ar Inflated by 10% per year Budget Reel Mini En F.M. constant	16647,10	18211,81	7134,40	8107,95	9192,45	10458,82
B) Renouveuement du Materiel non Finance (F.M. Constant 1977) Equipment replacement financed (1977)	Bejories budgetaises pour l'achat de materiel Budget requirements for equipment purchases					
			500	500	350	200

Travaux prices forus else exceuls i l'Eutocporte

L'amortisement a itc jons en compte dous le cada tes foaes de fouctioueisment de materiel inclus daut "ENTRETIEN COURANT"

TABLEAU - 5 - k

TABLE - 5 - k

M A L I

PROPOSITION PROGRAMMES INVESTISSEMENTS

Proposed Investment Programs

- REHABILITATION
- ENTRETIEN (Maintenance)
- FORMATION (Training)

(en millions de F.M. - in millions of MF)

ACTION A FINANCER	1977		1978		1979		1980		1981		1982		TOTAUX	
	TTC	HT	TTC	HT	TTC	HT	TTC	HT	TTC	HT	TTC	HT	TTC	HT
FRAIS FONCTIONNEMENT MATERIEL	617	370	1252	370	635	370							2505,25	1503,15
FORMATION PROFESS. (training)	75	56	75	56									150	112,5
ENTRETIEN PERIOD. (Périodic maint.)	4500	3375	9125	6845,75	4625	3470							18250	13691,5
REHABILITATION	6267,10	4700,3	6267,1	4700,3	4296,2	3222,2	4296,2	3222,2	4296,2	3222,2	4296,2	3222,2	29119	22289,4

Tableau 5-k (suite)
Table 5-k (continued)

S/Total	11459	8.501	16.719	12.403	9.556	7.062	4296,2	3222,2	4296,2	3222,2	4296,2	3222,2	50 624,2	37596,56
Augmentation coût Cost inflation 10 % / an	1,00		1,10		1,21		1,33		1,46		1,61		en millions F.M.	U.S. dollar
Minimum TTC	*		-		11.560		5113,9		6272,5		6916,9		30 463	61,2
HT		*		-		8.545		4285,5		4704,4		5187,7	22 722	45,6
Immédiat TTC	11.459		18.391		-		-		-		-		29 850	59,9
HT		8.501		13640		-		-		-		-	22 141	44,5
Estimation du montant devises en F.M.	6.875		11.035		6.936		3.428,3		3763,5		4150,14		38 187	76,7
Estimated Foreign exchange component US dollars (millions)	13,8		22,2		13,9		6,86		7,53		8,30			

* Pour la période 1977 - 78, le budget immédiat = budget minimum

For the first 2 years of the plan périod 1977 - 82, the immédiate and minimum budgets are equal.

6

MAURITANIA

6.1. Summary

Road maintenance in the Islamic Republic of Mauritania is presently carried out on approximately 25 % (1500 KMS) of the network for which the Ministry of Construction is nominally responsible--a total of 5085 KMS. This low coverage is the result of two principal constraints :

1) Woefully inadequate budgetary resources,
2) Severe shortage of qualified personnel.

The present study proposes a six-year "Minimum Program" to bring the Ministry's maintenance coverage up to 70 % (3500 KMS) of the assigned network. The program includes 370 KMS of réhabilitation works.

As part of the proposed program, three immediate actionne are required :

	Total Cost (in million MU)
1) Purchase of heavy equipment and spare parts,	185
2) Technical assistance,	78
3) Urgent réhabilitation and periodic maintenance projects.	1734
Immediate Needs - TOTAL	1997

In addition, the implementation of the proposed minimum program will require a recurrent budget in 1977 prices of 241 millions MU by 1982 (excluding depreciation), or thre times the 1977 budget (78 millions).

6.2. Road Network and Traffic

6.2. -1 Situation in 1977

Table 6 -a- presents the 1977 breakdown by traffic and road type of the Mauritanian road network, as classified in 1968.

The 1977 traffic levels were estimated from 1972 and 1974 traffic counts with a derived average annual growth rate up through 1977 of 4%.

6.2.2 Situation in 1982

The development of the road network by type of road for the period 1977-82 is based on assumed project/program implementation worked out with Ministry of Construction officials. Traffic growth over the same period of 5%/year has been used to forecast 1982 levels. The forecast 1982 network and traffic is presented in Table 6-b.

In terms of network modernization, the Government attaches particular importance to an investment program which will improve access to the northern part of the country. The initial stage involves:

1) Pavement of ATAR-CHINGHETTI (completed)
2) Pavement of AKJOUJT-CHOUM (to be undertaken after completion of the rehabilitation works presently underway)

6.3 Present Maintenance - Organization, Means and Methods

6.3.1 Organization and Personnel

The Ministry of Construction is presently being reorganized along the lines presented in Table 6-c. In the proposed new organization one service is responsible for the planning, execution and control of road maintenance as well as with the maintenance and repair of equipment.

In 1976, the Ministry included the following line personnel:

	Number of staff
Road Camps	160
Mechanical Division	89
Subdivisions	187
Ferries	35
Total (not including the administration)	471

The detailed breakdown is provided in Table 6-d.

6.3.2 Workshop and Equipment

There is presently a central workshop in Nouakchott and several garages or small workshops at the subdivisions. These entities are presently being reorganized in order to improve their effectiveness.

In 1977, there were 142 units of light and heavy equipment. At the End of 1977 additional equipment totaling 66 units will be received, financed by CIDA. The existing equipment fleet is in bad condition. Although approximately 40% of the units are in working condition, the lower availability of bulldozers (20%), dumptrucks (16%) and frontend loaders (22%) reduces overall work capacity to an average of 20% for resurfacing and materials transport.

6.3.3 Present Maintenance Levels

In 1975, routine maintenance activities were carried out over 2500 kms (49%) of the network for which the Ministry of Construction is responsible (5085 kms). However, by 1977 the network on which any routine maintenance was being carried out had fallen to an estimated 1500 kms or 29% of the Ministry's responsibilities. No periodic maintenance has been carried out. Thus, the road network is rapidly deteriorating.

6.3.4 Budget and Constraints

The Road Fund budget has remained virtually static (in current prices) over the last three years (77 million MU in 1974 and 79 in 1976). The personnel component has grown 46% of the total budget to 65% during the same period, with a consequent reduction in operating funds (see Table 6-e).

Under these conditions, the equipment has been poorly maintained and repairs neglected--to the obvious detriment of road maintenance. Further, the careless or negligent use of equipment has greatly aggravated the problem. The Minister of Construction has recognized the problem and had the entire equipment fleet brought into the central workshop for complete repair. However, the degree to which this action can succeed is severely limited by budget, qualified staff and organizational constraints.

6.4 Unit Costs

In order to establish the maintenance budget, a series of annual costs for maintenance operations have been established. These costs are summarized in Table 6-f. In calculating unit costs for both rehabilitation and periodic maintenance operations, contractors' prices were used. For those operations carried out by force account, a coefficient of 0.66 was derived and applied to contractors' prices. The economic cost of operations (without tax) was calculated at 75% of the financial cost (with tax).

The unit costs in Mauritania are obviously much higher than those which apply in neighboring countries. This is due to superior salary levels, difficulties in obtaining road materials (high transport and extraction costs) and long lines of supply over bad roads.

6.5 Rehabilitation Requirements

Present road rehabilitation needs are based on:

1) The linking of Nouakchott with the railroad to Nouadhibou (deepwater port and economic capital) through the rehabilitation of the road Akjoujt-Atar-Choum (railroad station), to be followed by opening up the northern part of the country.
2) The linking of the agricultural zones to the south (Boghe-Kaedi) and East (Kaedi-Kiffa).
3) The opening up of isolated zones: Tidjikja, Tamchakett and Selibaby.

Details of the total rehabilitation program (733 kms and 806 million MU) are presented in Table 6-g. The part remaining to be financed totals approximately 200 kms.

6.6 Maintenance Requirements

6.6.1 Immediate

Immediate maintenance needs begin with the repair of 60% of the equipment fleet, without which no serious maintenance program can be contemplated. This action implies two important elements:

1) purchase of a large quantity of spare parts;

2) technical assistance to fill line positions where Mauritanian specialists are lacking and to carry out a more intensive on-the-job training program than can be accomplished with present resources.

6.6.2 Minimum

1) Routine maintenance--the objective for routine maintenance is to maintain 3500 kms of road by 1982, of which over 800 kms will be paved.

2) Periodic maintenance--periodic maintenance is beginning to become necessary on the paved roads NOUAKCHOTT-ROSSO and NOUAKCHOTT-AKJOUJT. It will soon be urgently needed. The date when the surface coat should be renewed and the shoulders regraveled is reached in 1977. In order to avoid the necessity later on of partial reconstruction of the roads, periodic maintenance should be carried out now. Details are given in Table 6-h.

6.7 Recommended Programs and Resources

6.7.1 Immediate action program

The needs and actions giving rise to this program can be summarized as follows:

Needs	Proposed Priorities	Proposed Actions
Rehabilitation of equipment fleet.	I	purchase spare parts
Rehabilitation of equipment and planning, implementation, control of road maintenance	I	technical assistance (complementary and supplementary)
Rehabilitation of ATAR-AKJOUJT ATAR-AGUI AGUI-CHOUM	II (PM)	
Periodic maintenance of NOUAKCHOTT-ROSSO NOUAKCHOTT-AKJOUJT	II	resealing of road surface and resurfacing of shoulders
Rehabilitation BOGHE-KAEDI KAEDI-KIFFA	III (PM)	
Rehabilitation MBOUT-SELIBABY MOUDJERIA-TIDJIKJA KIFFA-TAMCHACHETT	IV	

PM=pour memoire: already financed 60% by IDA + Kuwait and 40% by the Mauritanian Budget.

6.7.2 Minimum program 1977-82

The "Minimum Program" proposed aims in 1982 at a full utilization of existing equipment plus that arriving at the end of 1977 under Canadian (CIDA) financing. That level of equipment utilization provides for the routine and periodic maintenance of 3500 kms of road (70% of the total assigned network), including 800 kms paved road, and for rehabilitation efforts on 370 kms.

a. operating budget

The operating budget has first been determined for the target year, 1982. It includes all current expenditures for routine and periodic maintenance plus those for rehabilitation. The breakdown of this budget was established based upon work group unit costs and is shown in Table 6-i. The budget, including depreciation, totals 302 million MU compared with the 1977 total of 79 million MU (no depreciation).

Budget and works programming between 1977 and 1982 has been carried out assuming that the required routine maintenance budget (129 MMU in 1977 prices) would be attained in 1980, and that including full depreciation by 1982. Table 6-j shows the proposed budget evolution, taking into account foreign financing and an annual cost escalation assumed to average 10%. While it is assumed that Mauritania will be able to underwrite full depreciation be 1982, other financing must be found for the intervening period. Figure 6-1 depicts both budgetary development (including partial depreciation) and that part of the budget for which a need for external financing is forecast (equipment renewal). This need totals 122 MMU during 1978-1982.

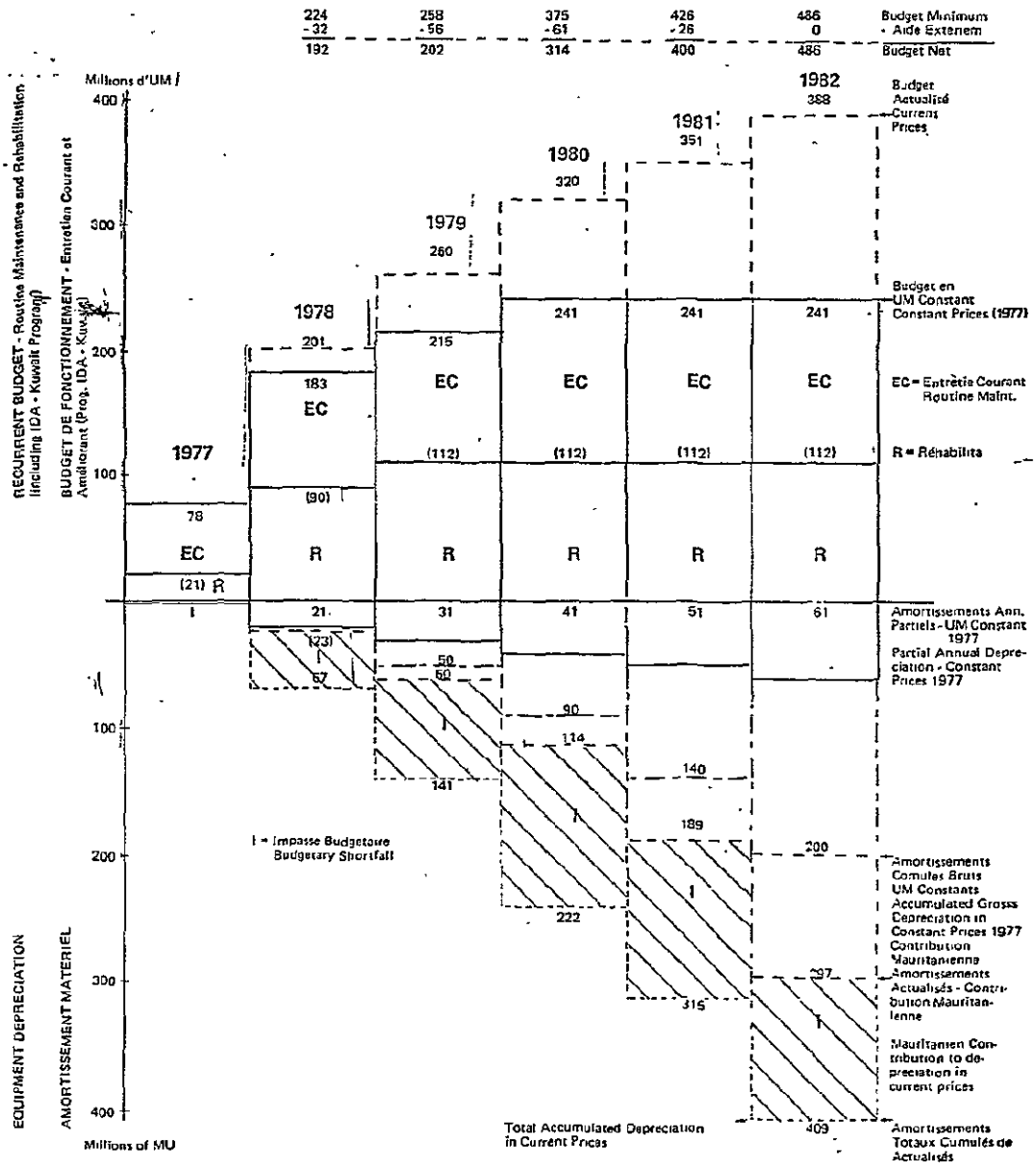
b. investments

The supplementary (not yet financed) investments within the scope of the Minimum Program are shown for the 1977-82 period in Table 6-k. This program totals 1964 MMU

GRAPHIQUE 6-1
FIGURE 6-1

MAURITANIE

EVOLUTION DU BUDGET MINIMUM 1977 - 1982
MINIMUM BUDGET FORECAST 1977 - 1982



(financial cost in current prices) with taxes and 1406 MMU without (economic cost). The "program" can be broken down:

	MMU with taxes	%
contracted works	1734	88
technical assistance	78	4
equipment and spare parts	152	8
Total	1964	100

Urgent programs represent nearly 60% of proposed investments: financial cost = 1168 MMU and economic cost = 887 MMU.

6.8 Training and Technical Assistance

Present Ministry of Construction personnel have not benefited from counterpart or "on the job" training to assist them in the normal execution of their work. This lack of technical knowledge or experience to apply technical knowledge appropriately has severely hampered public works administration.

The IDA, Kuwait Development Fund and Mauritanian Budget are presently financing a technical assistance program in which one goal is to train Mechanical Division and subdivision personnel. Consultants BCEOM - Lamarre Valois have in place a team of eight persons, including:

1 highway engineer
2 technical assistants
2 equipment inspectors
2 mechanics
1 training specialist

This team has recently been directed by the Minister to reorganize the Mechanical Division.

Taking into account the immediate needs of equipment repair, the severe lack of qualified personnel and the imminent arrival of a large quantity of new equipment (CIDA), the need of complementary technical assistance for on-the-job training is evident. Table 6-h$_a$

describes the qualifications and number of personnel to be trained. The proposed complementary program would consist of:

- 2 heavy equipment mechanics
- 1 storeskeeper for the M.D.
- 2 supervisors for the road betterment brigades
- 1 highway engineer for the training of subdivision chiefs

In order to assure coordinated and concerted action, this complementary personnel should be integrated with the existing team under the Directorate of Public Works. The program would initially run for two years and focus on on-the-job training through "atelier-ecoles" and "brigade-ecoles".

To properly mesh with the complementary program proposed, an extension of the existing technical assistance program would be required. Table 6-m provides the details.

Although included in the budget section, a breakdown of technical assistance costs is provided here:

complementary program 120 person-months	45.5 million MU
supplementary program (BCEOM-LVI) 64 person-months	24.2 million MU
Total	69.7 million MU

Tableau 6 a
Table 6 a

MAURITANIE

SITUATION DU RESEAU ROUTIER EN JANVIER 1977 (kilomètres)
ROAD NETWORK AS OF JANUARY 1977 (kilomètres)

Type de Route - Road Type

lassement lassification	bitumée paved	terre amé-liorée improved earth	terre or-dinaire ordinary earth	piste amé-liorée improved track	piste exis-tante existing track	total par classe total by class
ational Roads outes Natio-ales	465	433	1821	945	1041	4705
egional Roads outes Régio-ales	150	-	120	-	1460	1730
econdary Roads outes Secon-aires	-	-	125	140	390	655
otaux par ype/totals y type	615	433	2066	1085	2891	7090
ffecté ort.Resp.	465	1341		3279		5085
ntretenu aintained	465	994		1070		2529
sur total u réseau f network otal	9 %	6 %	29 %	15 %	41 %	100 %
	9 %	36 %		56 %		
rafic moyen ournalier véh/j) verage Dai-y traffic véh/d)						% du réseau % of Network
10 A		120	1314	805	2265	63 %
0 -30 B			382	210	512	15 %
0 -60 C		313	155	70		8 %
0 -100 D	150		215		114	7 %
00-200 E						-
00-400 F	459					7 %
400 G	6					-

Tableau 6 b
Table 6 b

MAURITANIE

SITUATION DU RESEAU ROUTIER EN 1982 (kilomètres)
ROAD NETWORK AS OF 1982 (kilomètres)

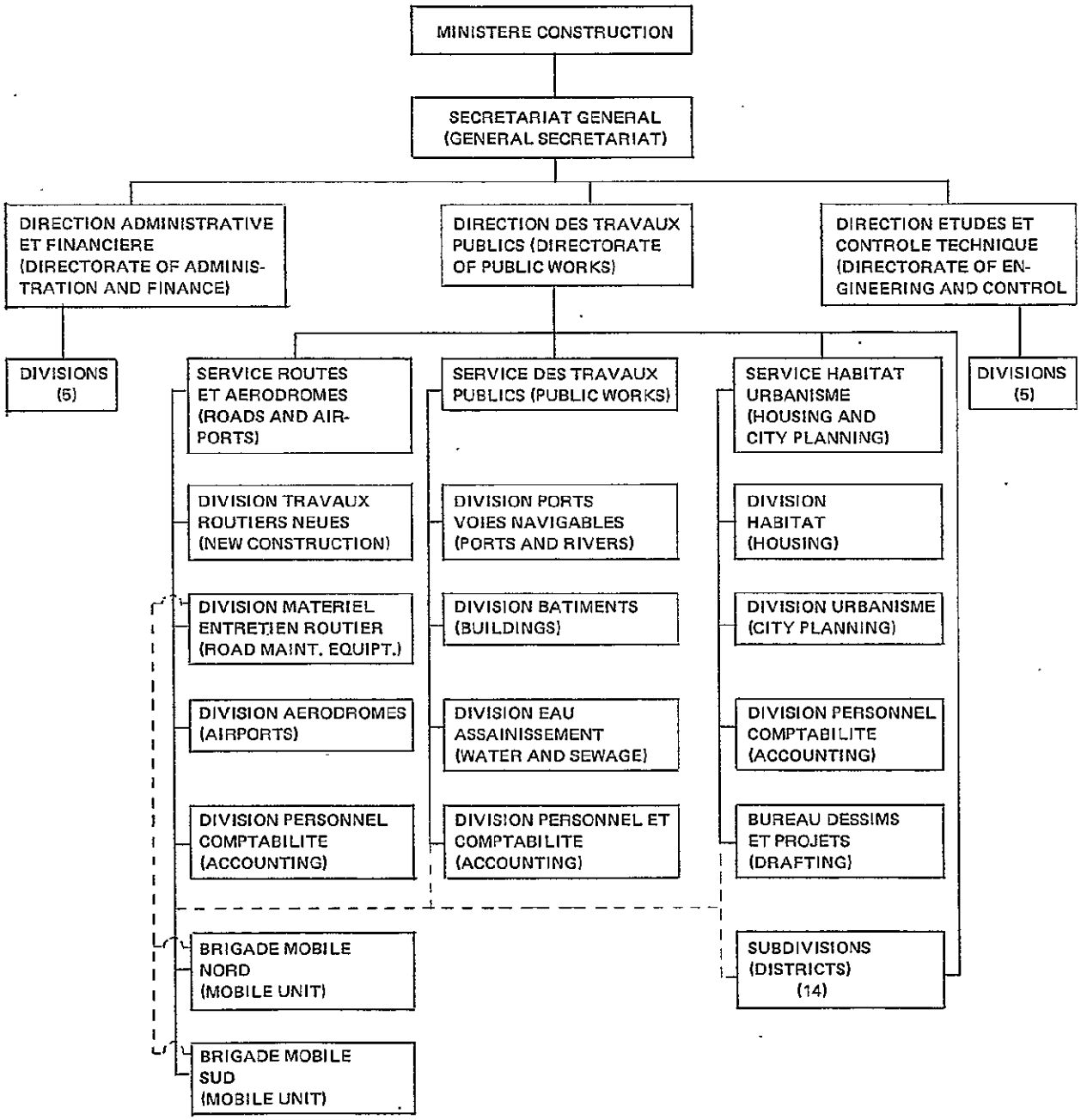
	Type de Route - Road Type					
lassement lassification	bitumée paved	terre amé-liorée improved earth	terre or-dinaire ordinary earth	piste amé-liorée improved track	piste exis-tante existing track	total pour classe total by class
ational Roads outes Nation-ales	1708	750	1189	70	1025	4742
egional Roads outes Régio-ales	547	120			1063	1730
econdary Roads outes Secon-aires			125	140	390	655
otaux par ype/Totals y type	2255	870	1314	210	2478	7127 (1)
ffecté ort.Resp.						
ntretenu ainteined						
sur total réseau f Network otal						
rafic moyen journalier véh/j) verage Dai-y Traffic véh/d)						% du réseau % of Network
<10 A	-	370	1314	140	2145	56 %
10 -30 B	120	-		-	-	1 %
30 -60 C	875	160		-	333	19 %
60 -100 D	645	340		70		15 %
100-200 E	150					2 %
200-400 F	256					4 %
> 400 G	209					3 %

(1) 7127 km = 7090 km + 37 km de route non classée
" " " of non classified roads

TABLEAU 6-C
TABLE 6-C

MAURITANIE

PROJET ORGANIGRAMME DU MINISTERE DE LA CONSTRUCTION
PROPOSED ORGANIZATION CHART OF MINISTRY OF CONSTRUCTION



SOURCE: Enquato de la Mission d'étude du Diagnostic, Mars 1977.
(Interview with Ministry Officials by the Diagnostic Study Team, March 1977).

Tableau 6-d
Table 6-d

MAURITANIE

ENTRETIEN ROUTIER - PERSONNEL EXISTANT (1/1/76)
ROAD MAINTENANCE - EXISTING PERSONNEL (1-1-76)

Bases Routieres Road Bases	Chief of Base Chefs de Base	Foremen Chefs d'Equipe	Mechanics Mecaniciens de Chantier	Equipment Operators Conducteurs d'engin	Drivers Chauffeurs	Clerks Commis	Total
Effectifs Totaux Total Personnel	4	7	11	24	39	3	88
dont - of which							
Decisionnaires BE	4	-	-	-	-	-	4
(Supervisors) FR	-	1	1	1	4	-	7
Journaliers (daily)	-	6	10	23	35	3	77
Aide, manoeuvre, gardiens, planton (assistants, workers, watchmen, janitors)							(72)

Division Materiel Mechanical Division	mechanics mécaniciens				skilled laborers ouvriers specialisés	stores magasinier	drivers chauffeurs	commis	Total
	cadres	shop atelier	maintenance d'entretien	aide					
Effectifs Totaux	5	8	5	8	10	5	4	8	53
dont:									
Decisionnaires BE	1	-	-	-	-	-	-	-	1
" FR	3	2	2	-	-	1	-	1	9
Journaliers FR	1	6	3	8	10	4	4	7	43
Manoeuvre, gardiens, divers (workers, watchmen, others)									(36)

(continued)

Tableau 6-d
Table 6-d
(continued)

Subdivisions (9)		Chefs de subdiv.	mec. chantier et chef atelier	mec. spec.	maga-sinier	chefs d'equipe	conduc-teurs d'engin	chauf-feurs	ouvrier special.	com. admin	Total
Effectifs Totaux		10	12	7	5	11	14	28	8	13	108
dont:											
Decisionnaires	BE	10	1	1	1	1	-	-	2	10	26
"	FR	-	5	5	1	6	8	15	1	-	41
Journaliers	FR	-	6	1	3	4	6	13	5	3	41
Aide, manoeuvres, gardiens, plantons											(79)
Personnel BAC (Betterment Brigade Personnel)											(35)

Total*		Bases Portiers	Division Materiel	Sub-divisions	Total	%
Effectifs Totaux		88**	53**	108**	249	100%
dont:						
Decisionnaires	BE	4	1	26	31	12
"	FR	7	9	41	57	23
Journaliers	FR	77	43	41	161	65

BE = Budget de l'Etat
National Budget

FR = Fonds Routier
Road Fund

* La direction non-compris (not including the administration).
** BAC, aide, manoeuvres, gardiens, plantons, etc. non-compris.

Tableau 6 - e
Table 6 - e

MAURITANIE

EVOLUTION DU FONDS ROUTIER
EVOLUTION OF ROAD FUND

(1974 - 1976)

DEPENSES - exprimées en millions UM

EXPENDITURES - expressed in millions of UM

Année - Year / ıbrique - Item	1974	1975	1976
I Personnel (a)	35,8	51,3	48,2
I Fonctionnement (b) operating expenses	30,1	23,0	27,0
II Etudes et travaux Neufs - Studies and New Construction	6,5	2,1	2,6
V Renouvellement du matériel Equipment replacement	2,5	0,8	0,9
Divers et imprévus Miseellaneous	2,5	0,8	0,6
TOTAL	77,4	78,0	79,2

ɔurce : Direction Infrastructure, Ministre de la Construction

Director of Infrastructure, Ministry of Construction

) Les frais de personnel comportent les salaires, charges et déplacements pour les Subdivisions, la Division du Matériel, des Bases routières, les Bacs et la Division Routes et Aérodromes.

Personnel expenditures include salaries, social charges, and allowances for the subdivisions, the Mechanical Division, the road camps, ferries and the Division of Roads and Airports.

) Ces dépenses concernent le fonctionnement du bureau, du matériel (carburant, ingrédients et réparation) pour la Subdivision, la Division du matériel et les Bacs.

These expenses include the operating costs of aquipment (fuel, lubricants, and repairs), offices, subdivisions, the mechenical division and ferries.

Tableau 6-f
Table 6-f

MAURITANIE

COUTS UNITAIRES D'ENTRETIEN ROUTIER
Unit costs of road maintenance
(prix 1977 - 1977 prices)

Activité Operation	Coût/km en milliers UM - Cost/km in thousands MU route bitumée paved road		Route en terre earth road		Autres - others	
	Financier financial	Economique économic	financier financial	économique economic	Finaicier financial	économique economic
1. Point à temps			8,470	6,440		
2. Reprofilage léger Light grading			10,270	7,160		
3. Lutte anti tole ondulée Anti corrugation			3,700	2,720		
4. Rechargement graveling			572,0	382,000		
5. Point à temps patching	24,300	14,860				
6. Entretien accotements maintenance of shoulders	69,250	48,250				
7. Subdivision + entretien courant Routine maintenance	9,030	8,630	12,030	11,500		
8. Bac Ferries ++					5000,0	4240,0
9. Division entretien++ routier et matériel Road of equipment maintenance div.					9080,0	8176,0

+ subdivision gére moyenne 300 kms de routes en terre et certaines

Tableau 6-g
Table 6-g

MAURITANIE

BESOINS EN REHABILITATION
REHABILITATION REQUIREMENTS

ésignation route ame of road	classe -ment classi fication	longueur length (km)	classe trafic moyen V/J AMT	ESTIMATION TTC with taxe	HT w/o taxes	10^6UM Devise Foreign	NOTES
KJOUJT ATAR	RN 1	45	30 - 60	40	30	24	programme IDA + KOWEIT
TAR AGUI	RN 1	102	10 - 30	73	55	44	réalisé en régie par T.P.
GUI CHOUM	NC	16	10 - 30	18	14	11	IDA + Kuwait financed programme executed by force account
OGHE KAEDI	RN 2	100	30 - 60	62	46	37	Financement en place - financing accorded
EDI KIFFA	RN 2	100	30 - 60	95	71	57	
'BOUT SELIBABY	RN 5	120	30 - 60	199+	141+	119+	programme UNSO non encore financé not yet financed
OUDJERIA TIDJIKIA	RN 3	130	10	157+	111+	94+	
IFFA TAMOHAKETT	RR 9	120	10	162+	115+	97+	

Prix à l'ENTREPRISE - pour obtenir l'équilence du coût des mêmes avaux réalisés en REGIE il faut multiplier les coûts Entreprise par ,66 (Source Rapport LVI sur Etude Pistes Sécheresse - Mauritanie

ota a) L'estimation du coût est basée sur les conditions économiques onnues au 1er janvier 1977

b) Le coût HT a été prix égal à 0,75 TTC

c) La part en Devises étrangères a été estimée à 0,60 TTC ou 0,80 pour les travaux en Régie et Entreprise

d) En annexe, détail des estimations

e) Pour le Programme UNSO, la décision du mode de réalisation n'est as encore défini, il a été retenu dans le tableau que les travaux eraient réalisés à l'Entreprise.

Tableau 6-g suite
Table 6-g continued

+ Contractors prices. To obtain the equivelent cost for the same work by force account, the contractor's price muat be multiplied by 0,65 (Source : Report of LVI on the Drought zones roads in Mauritanie, 1976).

Note : a) The estimate of coats is based upon economic conditions prevailing on 1.1.77

b) The without tax cost has been defined as 0,75 of the tax inclusive price

c) The foreign exchange component has been estimated at 0,60 of the tax inclusive cost or 0,80 of the without tax cost.

d) Detailed estimates are shown in annex.

e) No decision on the mode of execution of the UNSO program has yet been made. The table thus assumes that the work will be contracted out.

Tableau 6- h
Table 6- h

MAURITANIE

BESOINS ENTRETIEN
MAINTENANCE REQUIREMENTS

Désignations project names Besoins needs	classement classification	longueur length (km)	classe de trafic	ESTIMATION 10^6 UM			Réf.
				TTC w/tax	HT w/o tax	Devises foreign exch.	
PIECES RECHANGES Spare parts	-	-	-	30	18*	18	Estimation Ministre Construction
ASSISTANCE TECHNIQUE Technical assistance	-	-	-	70	56++		Par 6-8 formation
ENTRETIEN PERIODIQUE ROUTES BITUMEES Periodic maintenance on paved roads							
NOUAKCHOTT-ROSSO	RN 2	203	200-400	376	282	254	
NOUAKCHOTT-AKJOUJT	RN 1	256	200-400	493	370	333	

+ pour les piéces détachées HT = 0,60 TTC et devises = 0,60 TTC
for spare parts and foreign exchange = 0,60 TTC

++ pour l'assistance technique HT = 0,80 TTC
for technical assistance

Nota = Les coûts sont basés sur la condition économique du 1er janv. 1977
The costs are based on prices prevailing in January 1977.

TABLEAU 6-i
TABLE 6-i
MAURITANIE
PROPOSITION BUDGET MINIMUM DE ROUTINE
PROPOSED MINIMUM MAINTENANCE BUDGET
(1977 in millions of UM . en millions UM : base 1977)

	Nb N.	Total/an Annual total	M.O. (autre que D.M) personnel (except for M.D	Fonct.Mat. y/c Amort. Equip. operation Including deprec	Fonct. Bureaux Ateliers,Magas. Office, shop and Stores op.costs	Matériaux Material	Notes*
- DIVISION ENTRETIEN ROUTIER ET MATERIEL - Road Maintenance & equipment	I	9,080	5,500	2,380	1,200		EC+Reh
- SUBDIVISIONS	9	32,490	23,400	3,690	5,400		EC
- SECTEURS Rte en T(earth r.)	9	22,860	8,400	14,400	-		EC
Rte bitumee - paved road	2	5,080	1,880	3,200	-		EC
- REPROFILAGE - Reshaping	9	27,720	5,625	22,095	-		EC
- LUTTE ANTI TOLE Anti-corrugation	12	7,920	2,400	5,520	-		EC
- POINT A TEMPS BITUME Asphalt patching	2	17,000	2,600	4,880	-	9,520	EC
-GROUPE LOURD ENTRETIEN Heavy maintenance group	2	114,400	14,400	100,000	-		Rehab.
- ENTRETINE ACCOTEMENTS Rte Bitumee - Shoulder Maintenance paved roads	2	55,400	11,200	44,200	-		EC
- BACS - Ferries	I	5,000	3,000	2,000	-		EC
- DIRECTION ET SERVICES Fonctionnement - Directorate & Services coperation		5,000	1,000	2,000	2,000		Directio
TOTAL		301, 950	79,405	204,365	8,600	9,250	
Total arrondi					5	5	
Round total		302 =	80 +	204 +	8 +	9	

++ Affectation -Breakdown Operation

- ENTRETIEN COURANT (S/Amort) Current Maint. (no depreciat.)	129
- REHABILITATION (s/Amort)(no depr.)	112
- AMORTISSEMENT MATERIEL Equipment Depreciation	61

	302

++ Ventilation Brute - Gross Breakdown

- Fonctionnement Materiel : Amortissement 61
  Carburant 37 - P.Rechange 65 - Personnel 29
  Gestion Adm. 12 = 204
- Personnel autre DM 80
- Materiaux 9
- Fonct. Administrat. 9

302

* EC : Entretien courant - current Maintenance

Tableau 6-j
Table 6-j

MAURITANIE

PROPOSITION D'EVOLUTION DU BUDGET MINIMUM
FORECAST MINIMUM BUDGET REQUIREMENTS 1977-1982
(en millions UM)

A) BUDGET MINIMUM TOTAL	1977	1978	1979	1980	1981	1982
ENTRETIEN COURANT Curent maintenance	57	93+	103+	129	129	129
REHABILITATION	21	90++	112	112	112	112
AMORTISSEMENT Depreciation	1	21	31	41	51	61
EN UM CONSTANT in constant prices 1977	79	204	246	282	292	302
AUGMENTATION COUT K 10 % /an Inflated by 10 % par year	1,0	1,10	1,21	1,33	1,46	1,61
EN UM COURANT	79	224	258	375	426	486
B) PARTICIPATION EXTERIEURE Foreign Finoncing						
IDA KOWEIT : 60 %/an sur UM 187 à 4 ans sur réhabilitation 60%/an of UM 187 avec 4 years for rehabilitation		20	37	37	18	
ACDI 15 % P.Rech. UM 180 3 ans Entretien courant CIDA 15 % spare parts in UM 180 over 3 years for current maintenance		9	9	9		
PARTICIPATION TOTALE 3 Σ_3		29	46	46	18	-

+ 103 = 0,8x129
93=0,90x 103
++ 112x 0,80

TABLEAU 6-k

Table 6-k

MAURITANIE

PROPOSITION PROGRAMMES INVESTISSEMENTS
Proposed Investment Programs
- REHABILITATION
- ENTRETIEN - Maintenance
- FORMATION - Training

(en millions UM)

ACTIONS A FINANCER	1977		1978		1979		1980		1981		1982		TOTAUX	%
	TTC	HT	TTC	HT	TTC	HT	TTC	HT	TTC	HT	TTC	HT		
Achat pièces rechange Purchase of spare parts	30	18											30	18
Assistance Technique Technical assistance	14	11	35	28	21	17							70	56
Ent. Périd. NKC-ROSSO Périodic maintenance	38	28	338	254									376	282
" NKC-AKJOUJT			246	185	247	185							493	370
Réhabilitation														
- M'BOUT SELIBABY							199	141					199	141
- MOUDJERIA TIDJIKJA									157	111			157	111
- KIFFA TAMCHAKETT											162	115	162	115
Renouvellement matériel Equipment replacment	27	29	40	24	30	18	20	12	10	6	-		100	60
S/ TOTAL 1	109	84	659	491	298	240	219	153	167	117	162	115	1587	100
Augmentation coûts 10%/an Cost inflation	1,00		1,10		1,21		1,33		1,46		1,61		en millions UM	
Minimum TTC	109		725		361		291		244		261		1964	43
HT	-	84		540		250		203		171		185	1406	31
Immédiat TTC	115		725		361								1168	25
HT		84		540		250							847	19
Estimation montant en devises M. UM	76		435		217		175		146		157		1179	
Estimated Foretgnt exchange component M §	1,1		9,6		4,8		3,9		3,3		3,5			26,2

Achat de 15 camions neufs (6 M3)

Tableau 6-k suite
Table 6-k continued

AUGMENTATION DES COUTS 10 %/an 4 Σ_4	32	56	61	26	-
Budget réel minimum True minimum budget needs $\Sigma 2 - \Sigma 4$ 79	192	202	313	400	486
C) Renouvellement du matériel non financé (UM constants 1977) Equipment replacement not financed (in 1977 UM)	Besoins budgétaires pour l'achat matériel - Budget requirements for equipment purchases				
	40	30	20	10	0

Impasse budgétaire = I du graphique 6-K

Budgetary impass = I of figure 6-K

Tableau 6-1
Table 6-1
MAURITANIE

FORMATION POUR
L'ENTRETIEN ROUTIER ET LE MATERIEL
PROPOSED ROAD AND EQUIPMENT MAINTENANCE TRAINING PROGRAM

POSTE	Nb N°	Direction/Service Service	Durée Formation Training Period: sur le tas on thejob	Durée Formation Training Period: A l'extérieur overseas	Date Disponibilité-Date available	Notes
Directeur des Travaux Publics Director of Public works	1	Direction TP	2 ans years	en cours underway	8/77	à côté Conseiller works with advisor
Ingénieur routier Highway Engineer	1	Service Ent.Rout Road Maint. Serv	2 ans	en cours underway	8/77	à côté Chef Mission Consultant - With head of mission
Ingénieur Mécanicien Mechanican Engineer	1	Division Matér. Mechanican Divi.	2 ans	2 ans	9/79	à côté Chef Mission works with head of mission
Inspecteur Matériel	2	Division Matér.	1 an	1 an	9/78	
Mécaniciens Mechanics	10+9	DM et Sb divis. MD+Subdivis.	2 ans	-	de suite immediate	
Magasinier Storekeeper	4+10	DM + Subdiv+base MD = subdiv+base	2 ans	-	"	
Conducteurs Travaux	8	Subdivision	2 ans	-	"	
Subdivisionaires Subdivision Heads	14	Serv.Entr.Rout.	2 ans	-	"	

PERSONNEL EN FORMATION A L'EXTERIEUR - Personnel presently being trained overseas

3 Cadres dans la branche Travaux Publics (à affecter dans des Services dès leur retour pour une formation-adaptation au poste).

3 persons in public works engineering (to be allocated to the appropriate service upon return and to undergo a period of on-the-job training for their new posts).

Tableau 6-m

Table 6-m

MAURITANIE

PROGRAMME ASSISTANCE TECHNIQUE COMPLEMENTAIRE
COMPLEMENTARY TECHNICAL ASSISTANCE PROGRAM

Arrivée Mat ACDI (arrival of CIDA equipment)

IDA-Kuwait financed consultants CONSULTANTS IDA-KOWEIT	1977	1978	1979	1	2
	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D		
N°					
1 INGENIEUR ROUTIER	———	———	- - - - - - - - - - - -		10
2 INSPECTEUR MATERIEL I	———	———	- - - - - - - - - - - -		10
3 INSPECTEUR MATERIEL II	———	———	- - - - - - - - - - - -		5
4 ADJOINT TECHNIQUE I	———	———	- - - - - - - - - - - -		10
5 ADJOINT TECHNIQUE II	———	———	- - - - - - - - - - - -		9
6 MECANICIEN I	———	———	- - - - - - - - - - - -		10
7 MECANICIEN II	———	———	- - - - - - - - - - - -		9
8 SPECIALISTE FORMATEUR Training specialist	———	———	- - - - - - - - - - - -		10
Complementary requirements Besoins complémentaires					
MECANICIEN	-- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --			20	
MECANICIEN	-- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --			20	
MAGASINIER Storekeeper	-- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --			20	
CONDUCTEUR TRAVAUX Forman	-- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --			20	
CONDUCTEUR TRAVAUX	-- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --			20	
INGENIEUR ROUTIER Highway Engineer	-- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --			20	

1 : Programme complémentaire
Complementary Program

2 : Programme supplémentaire au contrat 8/76 CC-MF -IDA + Koweit + BN
Program supplementary to the existing contract of 8/76 CC-MF-IDA + Kuwait + BN

NIGER

7.1 Summary

The Central Service of Roads and New Construction presently maintains, through its three divisions and nine subdivisions, 64% (4492 km) of the network which is normally assigned to it (7051 km). This network will expand by 400 km prior to 1982, according to the Government's forecast.

Maintenance of this network is adequate except for periodic maintenance which is only one half the level of minimum maintenance, which will result in a deterioration of the network in the future, if complementary budget funds are not available to restore this maintenance.

In order to improve this situation, a minimum six-year maintenance program (1977-1982) is proposed which would increase the maintained network by 9% and would include rehabilitation of 1077 km, including 438 in an immediate program. This requires an investment in the short term, and an operating budget which is three times the present budget in future FCFA.

The investments are composed of: 3634 M FCFA for the purchase of equipment and spare parts, and 2257 M FCFA for rehabilitation (in 1977 prices). The minimum maintenance program will require 4428 M FCFA (in 1982 prices) for annual operations (without including depreciation). A small contribution of technical assistance is also forecast to help with receiving and initial usage of new equipment, and to reactivate the training center over a three-year period.

7.2 The Road Network and Traffic

7.2.1 The network and traffic - 1977

The Nigerian road network was classified by decree No. 68-107 MTP/TU of July 31, 1968 and is divided as shown in Table 7-a. The 1977 traffic levels were evaluated from the counts carried out by BCEOM in 1975. To update these figures a 6% annual growth rate was used.

7.2.2 The network and traffic - 1982

An annual traffic growth rate between 1977 and 1982 of 6% was assumed. The network is presently being improved by a program to widen all 3.5m paved roads to a 7 m width. Also a construction program for 850 km of paved roads is forecast for a net increase in the network of 400 km by 1982 (see Table 7-b).

7.3 Present Maintenance - Organization, Resources, and Methods

7.3.1 Organization and personnel

The organization of the Public Works services is shown in the following organization diagram (Table 7-c).

The Central Service of Roads and New Construction is responsible for the maintenance of the road network, its execution and its supervision and for the equipment division which is an autonomous service.

Traning resources are shown in Table 7-d.

7.3.2 Workshops and Equipment

There exists in Niger an equipment division which includes:

1) A central equipment yard in Niamey
2) A supplies section

3) An equipment inspectorate in Niamey, Maradi and Zinder

4) An administrative and accounting section

As for the equipment, there exists: (see Table 7-e)

1) 80 machines in working order (19 to be junked in 1977)

2) 120 vehicles in working order (118 to be junked)

3) misc. equipment (storage areas, electrical equipment, mobile cranes, quarry equipment, compressors, pumps, welding sets, cement mixers, etc.)

7.3.3 Present maintenance levels

Niger has 7051 km of roads (see Table 7-f) which include:

a - 3980 km regularly maintained (56%)

b - 1077 km partially maintained (15%)

c - 2016 km unmaintained (29%)

Maintenance is carried out in the following manner:

1) manual maintenance throughout the year.

2) light reshaping 250 days by dragging.

3) reshaping and compacting - average twice a year.

4) resurfacing - localized and limited. It is especially periodic maintenance which is not satisfying minimum maintenance.

7.3.4 Budget and constraints

Up to 1977 more than 50% of the maintenance personnel have been paid under the equipment budget. The result has been that the divisions and subdivisions cannot rent the equipment which they need for their assigned work. Starting in 1977 the Government has decided to take these personnel in charge in the general budget. In principle, this change will increase the available budget which is estimated at 40-60% of normal for the present network. Nevertheless the present budget is growing at a rate of 8% per year which is almost enough to compensate for inflation, but in real terms it has stagnated since 1973.

BEST AVAILABLE

7.4 Unit Costs

The minimum budget will be calculated on the basis of unit costs for road maintenance which have been derived from the activity reports of the division of Niamey-Dosso, 1975 and that of the PWD in 1973 (see Table 7-g). (The cost accounting system in Niger is exemplary.)

These costs have been calculated by taking into account an inflation rate of 10% per year. The elements taken from the Niamey-Dosso report have been reduced by 10% in order to estimate the average national costs in each category. For rehabilitation by contract, 1973 costs were updated.

7.5 Rehabilitation Requirements

The immediate requirements and those for the minimum maintenance program are based on the aim of increasing the viability of 438 km of earth roads and 639 km of improved track, including: (see Tables 7-h&7-i)

- Niamey - Tillaberry - Mali border
- Myriah - [illegible] - on the National Road
- Agadez - [illegible]

7.6 Maintenance Requirements

With the knowledge that 24% of the machines and 99% of the vehicles for road maintenance are ready to be written off, road maintenance must be started with the purchase of equipment and spare parts which amount to 3334 m FCFA. This amount is based on the needs of the crews to be formed. (see Table 7j)

7.6.1 Routine maintenance requirements

The first action to carry out consists of the routine maintenance of the 2850 km of paved roads and the 3151 km of improved earth roads and the 639 km of improved track giving a total of 876 m FCFA per year in 1977 prices.

7.6.2 Periodic maintenance requirements

The annual budget is broken down as follows:

Paved Roads	2850 km.	2852 m FCFA
Earth Roads	3151 km	583 m FCFA
Improved Tracks	639 km	26 m FCFA

For details see Table 7-k and 7-l.

7.7 Recommended Minimum Program

7.7.1 Immediate requirements

It is essential to realize that machines and vehicles which are written off are sold at auction and damaged vehicles are cannibalized for spare parts. Therefore the priority in expanding road maintenance is in the purchase of equipment and spare parts to enable the rehabilitation of 639 km of the immediate program, the routine maintenance of paved and improved roads and finally the rehabilitation of 639 km of improved track.

7.7.2 Operating budget

This budget was calculated for the six years from 1977 to 1982. It covers routine and periodic maintenance, rehabilitation and will grow to 1960 m FCFA in 1977 to 5812 m FCFA in 1982 (see Table 7-m). Foreign financing of 600 m FCFA

and 1750 m FCFA respectively was calculated by assuming that 80% of rehabilitation and periodic paved road maintenance costs would be financed by donors.

7.7.3 Investment

The amount of supplementary investment included in the program framework amounts to:

Contract Rehabilitation	2257 m FCFA
Equipment and Spare parts	3602 m FCFA
Improvement of Agadez-Arlit Division	50 m FCFA

under the assumption that rehabilitation will be carried out by a contractor. (Tables 7-n and 7-o)

7.7.4 Training and technical assistance

Niger presently employs 17 engineers and 14 technical assistants in the PWD. From existing training programs 16 engineers and 12 technical assistants will return in 1977 from other countries. Niger also has 1332 administrators and employees. Therefore the Consultant believes it would be most useful to reactivate the training center created by the BCEOM through formation of a brigade for on-the-job training, and by the provision of missing resources, including two qualified training experts. In addition two mechanical engineers are foreseen to aid in the reception and initial usage of equipment acquired during the first three years of the program.

N I G E R

RESEAU ROUTIER ET SON TRAFIC 1977
ROAD NETWORK AND TRAFFIC 1977

(en kilomètres)

assement/Type de Route assification and Type of Road	Bitumée Paved	En terre améliorée Improved Earth	Terre-Ordinaire Ordinary Earth	Piste-Ameliorée Improved Tracks	Piste-Ordinaire Ordinary Tracks	Tot[illegible]
seau Total tal Network	1889	2141	1193	639	2016	[illegible]
seau-Lié aux autorités twork under Ministry	1867	2091	438	639	2016	7051
seau-Entretenu en % of Network Maintained	95 %	80 %	0 %	16 %	1 %	54%
afic - Traffic éhicules/jour- (Véhicles/day						
10	428			167	2016	2611
10 - 30		652	150			802
30 - 60		607	288	472		1367
60 -100	480	732				1212
100 -200	614	100				714
200 -400	345					345
400						-
utes Nationales tional Roads	1867	2091	438	639	2016	7051
utes non classées n classified Roads	22	49	7.5			826
at de la chaussée au 9/76 ad condition						
n - Good	1736	909	66			2711
sez bon - Fair	98	869	200	101	41	1272
yen - Average	55	363	28	39		[illegible]
diocre - Poor						
ssable - Barely Passable			145	271	22	438
uvais - Bad				228	1930	2148

Tableau 7-b
Table 7-b

N I G E R

RESEAU ROUTIER ET SON TRAFIC 1982
ROAD NETWORK AND TRAFFIC 1982

(en kilomètres)

Classement/Type de Route Classification and Type of Road	Bitumée Paved	Terre Améliorée Improved-Earth	Terre-Ordinaire Ordinary-Earth	Piste-Améliorée Improved Track	Piste-Ordinaire Earth Track	Total
Réseau Total	2750	2427	724	639	2016	8556
Réseau-Affecté aux autorités	2716	1915	140	639	2016	7425
Réseau-Entretenu en %	100 %	100 %	100 %	100 %		73 %
Trafic - Traffic (véhicules/jour (véhicles/day						
10					2016	2016
10 - 30				639		1067
30 - 60	428					792
60 - 100		652	140			1743
100 - 200	480	1263				1463
200 - 400	1463					345
400	345					
Routes Nationales	2716	1915	140	639	2016	7425
Routes Non Classées	34	512	585			1131

Tableau 7-c
Table 7-c

NIGER

PERSONNEL - 1977

désignation category	DT P	SCRTN	DND	DMT	DZAD	DMTP	TOTAL
A. Ingénieurs administr. Engineers + Administrators	1	3	2	1	3	2	12
B. Techniciens	1	2	7	4	7	9	30
C. Agent de maitrise personnel qualifié Supervisors and foremen	1	1	5	6	7	10	30
D. Personnel spécialisé Skilled labor	5	5	95	63	53	281	502
E. Manoeuvres Laborers	-	-	343	172	280	3	798
TOTAL GENERAL	8	11	452	246	350	305	1372

DTP = Direction des Travaux Publics
Directorate of Public Works

SCRTN = Service central des Routes et Travaux neufs
Central service of roads and new construction

DND = Division de Niamey - DOSSO

DMT = Division de MARADI - TAHOUR

DZAD = Division de Zinder - AGADEZ - DIFFA

DMTP = Division du Matériel des Travaux Publics
Mechamial Divisision of Public Works

Source : Enquête du Consultant

Tableau 7-d
Table 7-d

NIGER

MOYENS ACTUELS DE FORMATION
PRESENT TRAINING RESOURCES.

INSTITUTION	Type de formation Type of training	Effectifs Nomber	Observations
ollège et lycée echnique	BAC et CAP	Variables suivants options élèves admis de 10 à 27	Zinder (Niger) France Côte d'Ivoire Sénégal Bamako Tchad Niveau supérieur et adjoints techniques
F P P	Technicien du niveau C (CAP)	Variable de 2 à 10	CERFER Lomé Côte d'Ivoire Chef équipe et ateliers
F P P C E O M	Perfectionnement niveau 4e catégorie (recyclage 4th level and retraining	Nombre variable de 15 à 20/ans	Ce centre doit être réanimé par formateur

C F P P = Centre de formation professionnelle et de perfectionnement
Source = rapport TP 1973 et adjoint chef DMTP

Tableau 7 - e
Table 7 - e

INVENTAIRE DU MATERIEL
EQUIPMENT INVENTORY

Designation Type of Equipment	Quantite (Quantity)	Annee de mise en circulation (start-up Year)	Annee de reforme (Junking Year)	Renouvellement (Replacement)
Engin chargeur sur Pneux Loader - on tires	4 2 1	1970 1974 1977	1978 1982 1985	4
Engin Scraper - Tracte Scraper on tracks	1 2	1968 1971	1978 1981	3
Tracteur Achenille/160/180c.v. Tractor on tracks	4	1970	1977	4
Tracteur A. Chenille/ 110/120cv Tractor on tracks	4 2 1	1970 1974 1976	1977 1981 1984	7
Engins Niveleuse Grader	2 12 1	1964 1970 1977	1977 1978 1985	8
Tracteurs a Balai Sweeper	31 8 1	1970 1971 1972	1979 1980 1982	
Compacteur Automoteur Compactor	1 1	1971 1974	1981 1984	2
Compacteur Tracte Compactor	0			6
Cylindre - Vibrant Vibrating Roller	2 1	1970 1974	1980 1984	2
Rouleau Pied de Mouton Sheeps-foot roller	0			4
Rouleau lisse Finishing roller	0			4

Tableau 7 - e (suite)

Designation	Quantite	Annee de mise en circulation (start up year)	Annee de Reforme (Junking year)	Renouvellement (replacement)
Camion - Atelier Mobile workshop	0			4
Camion - Benne Dumptruck	3 7 16 19 4	1973 1974 1975 1976 1977	1978 1979 1980 1981 1982	56
Camion - Citerne Tanker Truck	1 2	1971 1966	1979 1984	6
Camion Graissage Lubrication Truck	1	1974	1979	4
Camion plateau - Flatbed	1	1972	1977	3
Vehicule Point a Temp e Sprayer	3	1970	1980	3
Vehicule Tracteur Selle tte	2	1971	1979	1
Vehicule Tout Terrain All Terrain Vehicle	1	1976	1981	33
Vehicules Semi - Remorques porte char 10 ans	1	1971	1981	3
Vehicule remorque 2 essieux	0	1975	1982	1
" " 1 "	0	1952	1972	7
Vehicule Peugeot Break	1	1975	1978	12
Vehicule Peugeot camionette 750 kg	7	1975	1978	40
Pickup Trucks	9	1976	1979	
Vehicule Pick-Up	4	1975	1979	21
	2	1976	1980	
Vehicule de Liaison Divers General Purpose Vehicles	2	1973	1978	2
	4	1975	1979	4

Tableau 7 - f
Table 7 - f

NIGER

Entretien Routier Effectué Actuellement
Road Maintenance Presently carried out

DESIGNATION	Réseau reguliere ment entretenu (regularly maint network		Réseau partiellement entretenu (partially maint. network		Réseau non entretenu (un-maintained network
Nombre de km (number of km)	3980		1077		2016
Pour centage du réseau (of network	56%		15%		29%
Type d'entretien Type maintenance					
1. manuel (manual)	sur 85%		sur 30%		sur 3% (balisage) (markers)
2. reprofilage Compa (grading - compating)	2 campagnes an (2 traitements year)		1 fois an		
3. reprofilage leger (dry grading)	250 balais ans		2 campagnes an		-
4. rechargement (resurfacing)	localises et faibles (few and localized)				
Dépenses par km (expenditures par km) prix 1975(prices)	routes bitumées paved roads 535000	Routes en terre Earth roads 226000	158000		4600
% des dépenses normales**(of normal expenditures)	60%	60%	40%		0,5%
Evolution du budget (change in budget) million FCFA Francs courants*	1973	1974	1975	1976	1977
	1041	1100	1200	1300	1400
Budget demandé requested budget)	1041	Chiffres non disponibles, mais un croissance de 20% est souhaitée (figures not available but a 20% growth is desired)			
% du budget demande (of requested)	100%				

Source: Rapport TP 1973
* croissance estimee a 8% par an (growth estimated at 8% per year)
** appreciation travaux publics (estimate by Public works)

Tableau 7-g
Table 7-g

N I G E R

COUTS UNITAIRES DES TACHES D'ENTRETIEN ROUTIER
UNIT COSTS FOR ROAD MAINTENANCE TASKS
(en prix 1977 avec T.T.C. - 1977 prices with tax)

Tâche	Observations	Coût annuel par km
I ROUTES BITUMEES		
a) Points à temps et entretien des accotements		60.000 SFG 65.000 AFG
b) Autres tâches - périodiques	(I/II=cadence actuel de réfection dont le chiffre est 2xcoût actuel)	569.000 SFG 614.000 AFG
c) Entretien - Ouvrages et signalisation divers		9.000 SFG 10.000 AFG
Toutes tâches		638.000 SFG 689.000 AFG
II ROUTES EN TERRE		
a) Point à temps	applicable à toutes les routes aménagées	88.000 SFG 95.000 AFG
b) Drainage de la chaussée	Routes en terre et pistes améliorées	8.000 SFG 9.000 AFG
c) Lutte anti-tôle ondulée - Reprofilage	Toutes les routes en latérite	31.000 SFG 33.000 AFG
d) Entretien des ouvrages d'art	Toutes les routes	21.000 SFG 23.000 AFG
e) Entretien améliorant	Routes en terre et piste améliorées	115.000 SFG 16.000 AFG
f) Signalisation et divers	Toutes les routes en terre	5.000 SFG 6.000 AFG
g) Rechargement sur 15 cm d'épaisseur	Routes en terre moderne 1/ (1/5) (3xfréquence actuelle)	108.000 SFG 116.000 AFG
Toutes tâches		276.000 SFG 298.000 AFG

S.F.G. : Sans Frais Généraux
A.F.G. : Avec Frais Généraux

Tableau 7-h
Table 7-h

BESOINS EN REHABILITATION ROUTIERE

ROOD REHABILITATION REQUIREMENTS

(à l'entreprise - by contractor)

	longueur (length) (km)	Coût/km (cost/km*) (CFA)	Coût total TTC (total cost) (with taxe)
I. Besoins immédiats (Immediate needs)			
Routes en terre som. (Partially improved earth road)	438	2.600.000	1.138.800.000
2. Besoins minimum			
Pistes améliorées (improved tracks)	639	1.250.000	1.118.250.000
3. Total	1077		2.257.050.000

Source : Rapport Annuel TP, 1973, et le Rapport d'Activité T.P. Division Niamey - Dosso, 1975.

* Coût de rechangement plus 20% (Cost of resurfacing + 20 %)

Tableau & 7-i
Table 7-i

NIGER

BESOINS EN REHABILITATION ROUTIERE
ROAD REHABILITATION REQUIREMENTS

(à l'entreprise - by contractor)

	Coût total Total cost (TTC-with tax)	Amortissement (depreciation)	Pièces détachées (spare parts)	Carburant et huile (fuel and oil)	Main d'oeuvre (labor)
I. Besoins immédiats (immediate needs)	100 %	28%	26%	20%	26%
Routes en terre sommaire (partially improved earth roads)	1.138,80	318,86	296,09	227,76	296,09
2. Besoins minimum					
Pistes améliorées (improved tracks)	1.118,25	313,11	290,74	223,65	290,74
3. Total	2.257,05	631,97	586,83	451,41	586,83

Sources : Tableau 7-i et pourcentages de composants de l'analyse du Consultant

BEST AVAILABLE

Tableau 7-j
Table 7-j

NIGER

INVESTISSEMENT MINIMUM EN MATERIEL NEUF
MINIMUM INVESTIMENT IN NEW EQUIPMENT
(million de FCFA)

	Prix Unitaire Unit Price		Quantité	Cout Total Total cost	
	HT(w/o Tax)	TTC(w/Tax)		HT(w/o Tax	TTC(w/ Tax)
-Bulldozer D8	44,425	50,945	3	133,275	152,935
- Bulldozer D7	30,975	36,475	10	309,750	364,750
- Bulldozer D6	20,569	23,588	14	287,966	330,232
- Scraper	43,075	50,830	9	387,675	457,470
- Niveleuse (Grader)	16,580	19,570	13	215,540	254,410
- Chargeur 930	14,300	17,200	8	114,400	137,600
- Compacteur Automoteur	15,530	17,928	6	93,180	107,568
- Rouleau Vibrant	23,060	26,605	6	138,360	159,630
Camion Benne 4T	3,355	4,157	122	409,310	507,154
- Camion Benne 10T	7,090	8,825	44	311,960	388,300
- Camion citerne eau 7000 litres	5,295	7,950	9	47,655	71,550
- Camion citerne carburant (10.000 l)	7,9129	11,194	6	47,477	67,164
Vehicule Tout Terrain 8/10T 4x4	7,710	10,971	9	69,390	98,739
Camion Porte Char 32/36T	14,712	18,325	3	44,136	54,975
Peugeot Break	1,430	2,320	12	17,160	27,840
Peugeot Bachee 750kg	1,225	1,900	40	49,000	76,000
Vehicule - Pickup	2,346	3,728	21	49,266	78,288
Total				2725,500	3334,505

Tableau 7-k
Table 7-k

N I G E R

BESOINS MINIMUM EN ENTRETIEN ROUTIER EN 1982
MINIMUM ROAD MAINTENANCE REQUIREMENTS IN 1982

	Longueur (length)	Coût/km (cost/km	Coût total (Total cost)
			(in FCFA)
1. Entretien courant (Routine Maintenance)			1
a) routes bitumées (paved roads)	2.850	75.000	213,75
b) routes en terre (earth roads)	3.151	182.000	573,48
c) pistes améliorées (improved tracks	639	140,000	89,46
Total	6.640		876,69
2. Entretien périodique (periode Maintenance)			
a) routes bitumées (paved roads)	2.850	689.000	1.963,65
b) routes en terre (earth roads)	3.151	116.000	365,52
c) pistes améliorées (improved track)	639	26.000	16,14
Total	6.640		2.345,31

1. Prix unitaires du tableau 7-h (unit prices from table 7-g)

* 30 % de la longueur recharge x 1,10 aug. en prix unitaires + .67 largeur par rapport au coût de rechargement sur les routes en terre.

Tableau 7-1
Table 7-1

N I G E R

COMPOSANTS D'ENTRETIEN ROUTIER MINIMUM
MINIMUM ROAD MAINTENANCE COMPONENTS
(millions de FCFA TTC with taxes)

Désignation	Coût total Total cost* (MFCFA)	Amortissement (depreciation)	Pièces détachées (spare parts)	Carburants lubrifiants (fuel and oils)	Main d'oeuvre (Labor)
1. Entretien courant (routine maintenance)					
a) Routes bitumées (paved roads)	181,68	45,42	38,15	39,97	58,14
b) Routes en terre (earth roads)	487,46	121,87	102,37	107,24	155,98
c) Pistes améliorées (improved tracks)	76,04	19,01	15,97	16,73	24,33
Total	745,18	186,30	156,49	163,94	238,45
2. Entretien périodique (periodic maintenance)					
a) Routes bitumées (paved roads)	1.669,10	83,00	83,00	1.420,10**	83,00
b) Routes en terre (earth roads)	310,69	87,00	80,78	62,13	80,78
c) Pistes améliorées	13,72	3,84	3,57	2, 74	3,57
Total	1.993,51	173,84	167,35	1.484,97	167,35
3. Frais généraux (15 %)	410,80				
4. Total généraux	3.149,49				

* Coûts du tableau 7-k réduit de 15 % des frais généraux
** Y compris les coûts de matériaux
1) 25 % Amort., 21 % pièces dét., 22 % carb., 32 % M.O.
2) 5 % Amort., 5 % pièces dét., 85 % matériaux et carb., 5 % M.O.
3) 28 % Amort., 26 % pièces dét., 20 % carb., 26 % M.O.

Tableau 7-m
Table 7-m

NIGER

BUDGET DE FONCTIONNEMENT MINIMUM 1977-1982
MINIMUM PROGRAM OPERATING BUDGET
(millions FCFA)

	1977	1978	1979	1980	1981	1982
1. Budget Minimum						
a. Entretien Courant et Periodique (routine and periodic maint.)	1200	1430	1660	1890	2120	2350
b. Rehabilitation*	250	500	500	500	500	500
c. Frais Généraux (overhead)	200	240	280	320	360	400
d. Amortissement (Depreciation)	310	320	330	340	350	360
Total (FCFA constant)	1960	2490	2770	3050	3330	3610
Facteur d'inflation (inflation factor)	1.0	1.10	1.21	1.33	1.46	1.61
Total (FCFA courant) (inflated FCFA)	1960	2739	3352	4057	4815	5812
2. Participation Exterieure (Foreign Financing)						
a. 80% Rehabilitation	200	400	400	400	400	400
b. 80% Entret. Périodique des Routes Bitumees (Periodic Maint. on paved Roads)	400	590	780	970	1160	1350
Total (FCFA constant)	600	990	1180	1370	1560	1750
Total (FCFA courant) (inflated FCFA)	600	1089	1428	1822	2192	2818
3. Budget Réelle Min (True Min Budget)	1360	1650	1924	2235	2623	2994

* A l'Entreprise - (by contractor)

Tableau 7 - n

Table 7 - n

Niger

Besoins en Investissement
(Investissement requirements)
(millions FCFA)

Designation	Prix TTC Price with Taxes	Taxes	Devises (foreign exchange)	Monnaie Locale (Local currency)
1. Amenagement (Improvement) Subdivision Arlit et la division d'Agader	50,00	9,00	11,00	39,00
2. Achat matériel (Equip. Purchase)	3334,505	609,005	2725,500	0
3. Pièces detachées (spare parts)	266,760	48,017	218,743	12,00
Total	3651,265	666,022	2955,243	51,00

Source: Tableau organique matériel, TP 1975
Inventaire matériel
(Equipment Inventory)
Prix achat matériel et matériaux Niamey
(Purchase price Niamey for materials and equipment)

Tableau 7-o
Table 7-o

NIGER

Programme minimum d'investissement
Minimum investment program
(millions FCFA) TTC-with taxes

Type	1977	1978	1979	1980	1981	1982	TOTAL
1. Aménagement Division Agadez (improvement)	-	25	25	-	-	-	50
2. Matériel (equipment)	3335	-	-	-	-	-	3335
3. Pieces détachées (spare Parts)	267	-	-	-	-	-	267
4. Assistance technique	6	6	6	-	-	-	18
TOTAL	3608	31	31	-	-	-	3670

(en prix constant - in constant prices 1977)

8. SENEGAL

8.1 Summary

From 1971/72 to 1974/75 the size of the road network to be maintained in Senegal developed as follows:

	1971/72	1974/75	change
Paved Roads	2499	3130	+ 17%
Earth Roads	6928	6582	-5.6%

Over the same period, funds accorded by the Government for road maintenance represented only 34% of the amount required by the Directorate of Public Works. In fact, since 1963 the budget for road maintenance has steadily declined in real terms, while the volume of maintenance responsibility has grown.

The situation is of course exacerbated by the normal aging and wear-and-tear on the network. In addition, the budget does not take the depreciation of Public Works equipment into account.

Maintenance responsibilities during 1975/76 as obtained from the Four-Year Maintenance Programme concern the following:

2499 kms of paved road
3307 kms of earth road

In order to maintain this network most effectively during the 1977/78 financial year, the following Immediate Actions must be undertaken:

1) achieve the forecast budgetary level for routine maintenance during 1977/78 (there is still far to go inspite of a 15%/year increase between 1975/77);
2) rehabilitate certain links which have not been maintained for sometime or which have been seriously damaged during successive rainy seasons.

The cost estimate for these actions is:

Budgetary supplement for road maintenance	476.0 million FCFA
Major rehabilitation works	189.5 million FCFA
Total	665.5 M. FCFA

8.2 Road Network and Traffic

8.2.1 Network and traffic 1977

The senegalese road network is classified as follows:

- National Roads 3580 kms
- Regional Roads 930 kms
- Departmental Roads 5202 kms

Table 8-a presents the salient features of the network. Traffic levels were established based on counts executed between 1971 and 1976 - - particularly on those of 1975 and 1976. The average annual growth rate was computed at 6.7%.

8.2.2 Network and traffic 1982

The size and composition of the road network in 1982 was forecast based upon projections by the Ministry of Public Works, Urbanism and Transport MPUUT as well as on specific projects already underway or due to commence soon, including:

-- Repair of rural roads for development and "désenclavement" within the framework of the Urgent Aid to the Sahel project (financed by the EDF).

-- Second Highway project of the IBRD concerning rehabilitation and improvement of 1,551 kms of rural feeder roads.

Table 8-b provides the details of the 1982 road network forecast, including traffic, which has been assumed to

BEST AVAILABLE

8.3 Present Maintenance - Organization, Means and Methods

8.3.1 Organization and personnel

The Decree N°75829 of July, 1975 concerning the reorganization of MPUT, provided for the creation of a Road Maintenance Division (DER). This division is accountable to the Directorate of Public Works and is responsible for the organization and supervision of road maintenance. Its role between the Directorate and the arrondissements is still being defined. Table 8-c sketches its principal activities.

There exists a hierarchy of maintenance teams:

1) Regional Teams (12): attached to the Public Works arrondissement offices to carry out routine maintenance and any unforeseen tasks
2) Interregional Teams (12): attached temporarily to PW arrondissements for complementary routine maintenance activity.
3) DER Teams (8)

It should be added that 3 supplementary regional teams are envisioned in the IBRD sponsored rural feeder roads project.

8.3.2 Workshops and equipment

1) The performance of the Central Equipment Unit (PGM) is not yet satisfactory and there is also a lack of qualified mechanics. The efficiency of the PGM could be much improved through better organization aimed at rapid and systematic execution of repair and servicing tasks.
2) Repair and maintenance of equipment:

   Equipment managed by the PGM is listed in Tables 8-d to 8-f. Its condition is in part due to the lack of qualified personnel which inhibits rapid reparis. In addition, urgent work orders frequently result in the prolonged stoppage of normal repairs. The situation is better in the arrondissements.

   Mobile service stations, operated by the BECM are operating satisfactorily and their effect can be seen in the reduction of major breakdowns. The training of personnel for these stations must be continued.

3) Equipment overhaut takes place in auxiliary workshops at THIES, ST. LOUIS and TAMBACOUNDA. The first lacks tools and the last two lack supervisory personnel.

4) Service stations and garages consist of mobile (see above) and fixed. Both are operating satisfactorily.

5) Supply system is not functioning efficiently. There are serious delays in registering parts on arrival in the storeroom and in their dispatch to arrondissements.

5) Cost accounting systems for the FCM have just been established within the BECM (Office of Studies, Coordination and Methods) and will permit:
   -- the establishment of equipment utilization costs;
   -- a coherent work order system.

8.3.3 Present maintenance levels

Routine maintenance operations carried out in 1975/76 concerned 2499 kms of paved roads and 3370 kms of earth roads. Maintenance work by the mobile teams has improved year after year due to particular budgetary emphasis on these units and a reduction in the frequency of equipment breakdowns. However, the level of maintenance carried out is limited by budgetary constraints.

8.3.4 Financial resources and constraints

The funds voted for maintenance of the national road network(excluding feeder roads, structures, and maintenance and operation of ferries) as well as the budget forecasts prepared by the Directorate of Public Works for the period 1970/71 - 1976/77 are presented in Table 8-g. Translating the figures indicated in the column "crédits votés" into constant Francs, reveals that in 1973, for a paved road network approximately one-half of the present, the funds available were nearly double those allocated in 1976/77. The constant decline in maintenance budget is all the more serious in view of the progressively heavier use of the road network.

Table 8-h presents the cost of maintenance in 1975 prices for the period 1963/75 by kilometer of paved road.

8.4 Unit Costs

Unit maintenance costs per km were established in 1977 prices. These permitted the annually maintenance budget requirements to be estimated for each succeeding fiscal year. Table 8-i presents the average direct maintenance costs per km for 1975/76 by maintenance teams (resurfacing, patching, ditching, etc.). Per kilometer average maintenance costs for paved and earth roads were calculated for both contractor and force account components:

-- paved roads	191,473 FCFA
-- earth roads	99,289 FCFA

Analysis of the budget reveals that the funds allocated in 1975/76 were not sufficient to cover the rental costs of equipment and vehicles established by the PCR.

8.5 Rehabilitation Requirements

Present needs are restricted to the immediate rehabilitation of important road links the normal maintenance of which has long been neglected or which have been severely damaged during successive rainy seasons. The program concerns the following links:

FATICK - KAOLACK
LOUGA - LEONA - COLOBANE

as well as several other roads, the rehabilitation of which has been requested by government authorities. The total cost is estimated at 189.5 million FCFA.

The paved road reinforcement programs currently underway should be mentioned:

- 892 million CFA over two years on 109 kms and will be completed in June, 1977 (IDA financed).
- 221 kms for which the engineering study has recently been completed.

8.6 Maintenance Requirements

8.6.1 Immediate

These concern routine maintenance over the network and the quality envisioned in the Four-Year Maintenance Plan presently being executed.

8.6.2 Minimum

Minimum maintenance of the road network is to be ensured by an increased budget (see Section 8.7 which follows).

8.7 Recommended Programs and Resources

8.7.1 Immediate needs and actions

The immediate program actions and the needs giving rise to them can be briefly listed:

Needs	Actions
1- Attainment of maintenance level targeted in the Four-Year Maintenance Program (underway).	Achieve Budget level requested each year.
2- Rehabilitation: FATICK - KOLAC LOUGA - LEONA LEONA - COLOBANE	Obtain financing outside of the present maintenance budget.
3- Reinforcement - 109 kms	F.L. Project underway
4- Reinforcement - 221 kms	Study completed

BEST AVAILABLE

8.7.2. Linimum Program 1977 - 1982

1) Recurrent budget: The recurrent expenditure to take into account must cover routine and periodic road maintenance requirements. Table 8-j provides a breakdown of Senegal's maintenance budget for the period 1970/71 - 1976/77, while Table 8-k gives the breakdown of the forecast budget which the Consultant recommends. The transfer of maintenance expenses associated with the end of the IDA-financed second Highway Project will have to be taken into account in the 1982/83 budget.

Senegal must make a significant effort to overcome the forecast budget shortfall which obtains through 1981/82 if no improvement is made. The forecast shortfall is presented in Table 8-l. An equally disturbing aspect of this situation is that equipment, presently in working condition, will not be able to be replaced as limited resources permit no depreciation to be set aside for replacement purposes.

2) Investment. The only investment necessary if the budget gap is allowed to remain would be that for equipment replacement.

8.8 Training and Technical Assistance

8.8.1 Training

From 1975 to 1976, training activities were limited by lack of minimum budgetary resources; a consequence of the budget gap discussed previously. However, in general, the ministerial personnel has received adequate upper level training commensurate with the requirements of their daily work.

A specialist in training took up his post in 1976. Training programs and seminars have been held for the following personnel;

- 2 regional workshop managers
- 3 service station chiefs
- 2 garage chiefs
- 2 supply/procurement specialists, drivers and equipment operators.

Finally, an effort has been organized to identify workshop personnel with good mechanical aptitude.

8.8.2 Technical assistance

The technical assistance presently posted to the Public Works is sufficient.

Tableau 8 - a

Le Reseau Routier et son Trafic (1977)

Classification	Routes Revetues	Routes en Terre a caracteristique definitives	Routes en terre Amelioree	Route en Terre	Route en Terre ou sable	Total
Routes Nationales	1961	461	1158	0	0	3580
Routes Regionales	370	0	450	110	0	930
Routes Depart.	165	0	3.420	1625	0	5210
Routes Identifiers	0	0	0	2240	1290	3530
Total	2496	461	5028	3975	1290	13.250

Trafic Journalier Moyen			Routes en Terre Amelioree ou non		
< 10	-	-	7185	1290	8475
10 - 30	-	-	260		260
30 - 60	-	-	420		420
60 - 100	20	-	540		560
100 - 200	90	461	310		861
200 - 400	1368	-	288		1656
> 400	1018	-	-		1018
Total	2496	461	9003	1290	13250

Tableau 8 - b

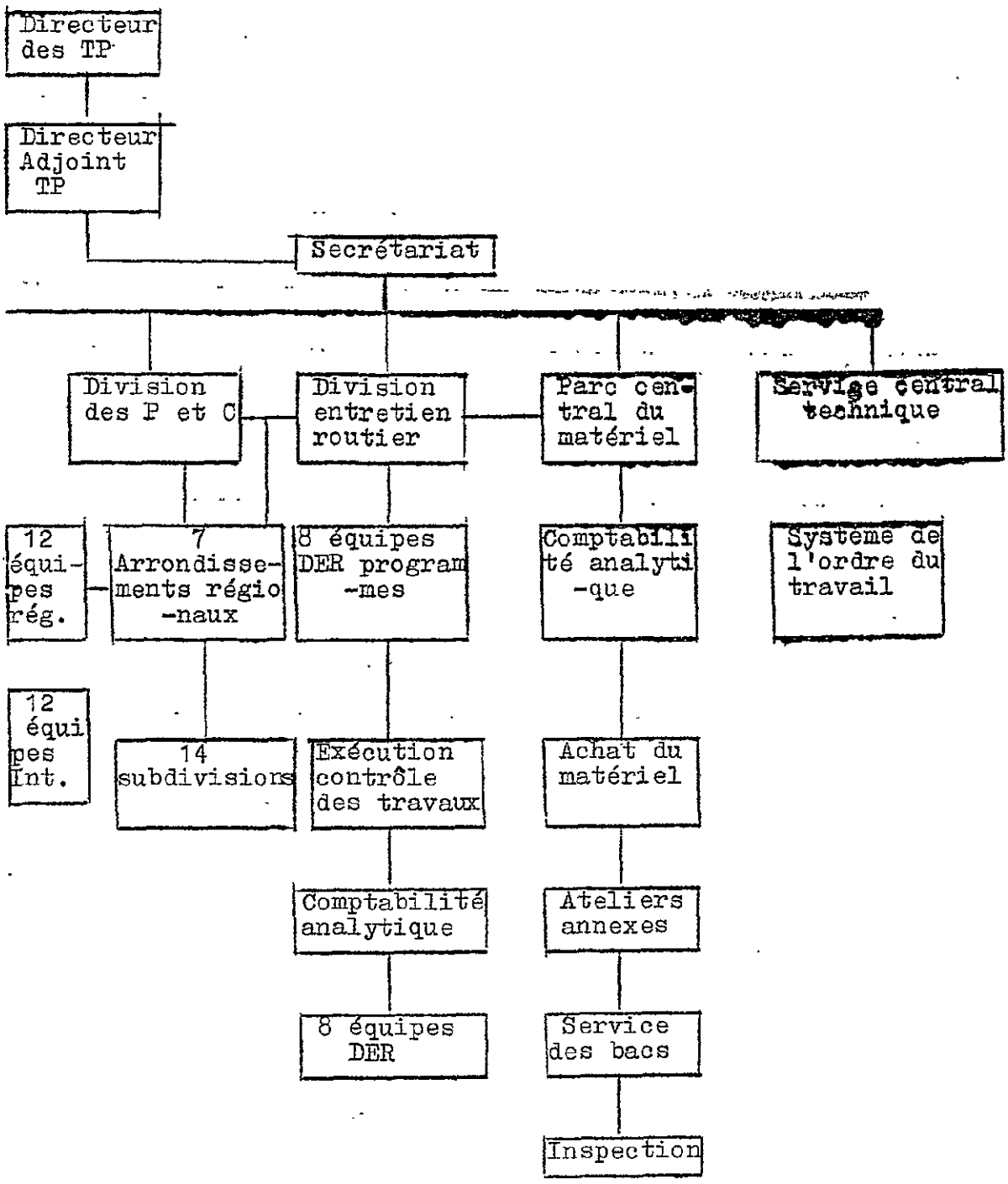
Le Reseau Routier et Son Trafic (1982)

Classifieation	Routes Revetues	Route en Terre a caracteristiques definitives	Routes en terre Amilioree	Routes en Terres	Pistes en terre ou sable	Total
Route Nationale	2484	-	1096	-	-	3580
Routes Regionale	502	-	428	-	-	930
Routes Departe-mentales	228	-	4526	456	-	5210
Routes Identif	0	-	257	2283	990	3530
Total	3214	0	6307	2739	990	13.250
Trafic Journalier Moyen			Routes en terre Ameliorea ou non			
< 10	-	-	5030		990	6020
10 - 30	-	-	2585		-	2585
30 - 60	-	-	270		-	270
60 - 100	-	-	415		-	415
100 - 200	228	-	529		-	757
200 - 400	892	-	186		-	1078
> 400	2094	-	31		-	2125
Total	3214	0	9046			13250

Tableau 8-c
Table 8-c

SENEGAL

ORGANIGRAMME DE L'ENTRETIEN ROUTIER - SCHEMA GENERAL
Organisation diagram of road maintenance - general form



(Continued)

Tableau 8-c
Table 8-c

SENEGAL

Division Entretien Routier - Schéma Général des Taches
Road Maintenance Division - General Task Description

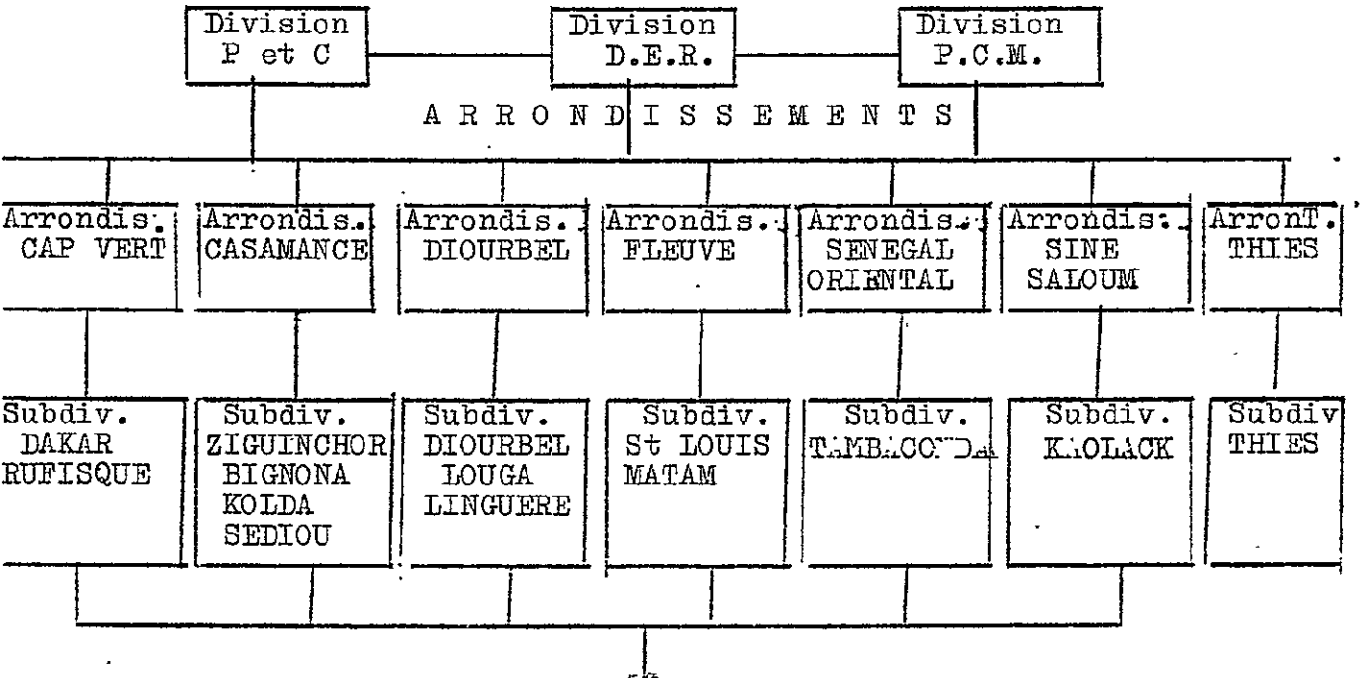
D.E.R.	Bureau des programmes (program office)	-Proposition pour l'établissement du budget annuel de l'entretien - Formulation of annuel maintenance budget. -Etablissement du programme annuel de l'entretien routier - Formulation of annuel road maintenance program.
		-Préparation des appels d'offres pour fourniture et transport des matériaux et marché d'entreprises pour entretien -Contrôle et établissement des décomptes Preparation of tender documents and their evaluation for materials transport contract awords
	Contrôle des travaux (work supervision)	-Mission sur les lieux des travaux - Job site inspections
	Bureau d'exploitation (operations office)	-Organisation et exploitation des Résultats des comptages - traffic counts and data processing Recueil et exploitation des rapports mensuels des arrondissements - collection and analyses of monthy reports from arrondissements
	Comptabilité analytique (cost accounting)	-Etablissement des rendements et coûts - Establishment of costs and productivities
	Equipes travaux (work teams)	-6 équipes DER - 6 teams -road maintenance division

(Continued)

Tableau 8-c Bis
Table 8-c Bis

SENEGAL

DIVISION P ET C
Schéma général (general form)



Taches (tasks)
- Etablissement des schémas linéaires des travaux des routes en terre devant servir à la programmation des équipes de la DER (drawing up the liveor plan for earth roads for the programming of erews by the DER)
- Elaboration des marchés de transport de latirite (drawing up contracts for the transport of laterite)
- Enquête trafic routier (road traffic suweys)
- Déroulement de l'inventaire routier (road inventory)
- Détermination des priorités (determination of priorities)
- Etablissement du plan de campagne régionale (drawing up the regional maintenance plan)

(Continued)

Tableau 8-c
Table 8-c

SENEGAL

Nombre Type et Activité des Equipes d'Entretien - 1977
Nombre, Type and Operations of Maintenance Groups -1977

Nb d'Equipes N° of Groups	Zone géographique Geographic zones	Activitées Operation
7	Régionales	Travaux généraux - General work
6	Régionales	Reprofilage et rechargement Regrading and resurfacing Partiel - Partial
3	Régionales	Reprofilage - regrading
6	Régionales	Buttage
6	Régionales	Point à temps - patching
1	Interégionales	Reprofilage - regrading
2	Interégionales	Fauchage mécanique - grass cutting
2	Interégionales	Rechargement - resurfacing
2	Interégionales	Signalisation horizontale signalization

Tableau 8-d
Table 8d

SENEGAL

LISTE DU MATERIEL AU PARC CENTRAL DES TRAVAUX PUBLICS

AU 1er MARS 1977
Equipment inventory for public works fleet
As of 1 march 1977

CATEGORIES	Nombre de machines considérées comme opérationnelles	Plus de 10 ans	de 10 à 4 ans	de 4 à 1 an	Neuves
Bulldozers à chenille de 200 CV	33	16	7	2	8
Chargeurs à chenilles de 180 CV	13	8	5		
Chargeuses sur pneus de 80 CV	26		3	17	6
Niveleuses TOTAL	82	21	12	20	29
70 CV	9	4	5		
100 CV	19		1	18	
130 CV	54	17	6	2	29
Scrapers tractés	7	7			
Pelles hydrauliques 50 CV	4			4	
Compacteurs automoteurs 70 CV	5				5
Rouleaux cylindres lisses	16	4	4	8	
Rouleaux vibrants à main	23		13	10	
Rouleaux à pneux tractés	31	5	6	15	3
Tracteurs agricoles 50/80 CV	44		32	4	8
Faucheuses à lames	5			3	2
Chariot élévateurs	5	3	2		
Grives automotrices	2	1			1
Marqueur de lignes	6		2	4	

Table 8-d
Continued

CATEGORIES	Nombre de machines considérées comme opérationnelles	Plus de 10 ans	de 10 à 4 ans	de 4 à 1 an	Neuves
Compresseurs	6			2	4
Bétonnières	13		10		3
Groupes moto-pompes	56		14	26	16
Camions benne 6 M^3	92	4	43	19	26
Camions citernes 10 000	43		17	16	9
Tracteurs routiers avec remorque porte engins	10		4	5	1
Camions point à temps	18		12		6
Camions station service	13		2	7	4
Camions de servitude T. 5 à benne	46		23	7	16
Véhicules de liaison tous terrains	33		15	7	11
Camionnettes légères 400 à 800 kgs C.U	57		34	13	10
Véhicules breaks	30		18	12	
Véhicule berline	18		17	1	

Tableau 8 - e
Table 8 - e

SENEGAL

Effectifs du Materiel - Effectif du Personnel

Units of Equipment - Number of Personnel

D.E.R. - R.M.D.

Materiel Equipment	Total Materiel Equip. Equip (Groups)	Materiel Appoint des Arrondissements Arrondissements	Total Materiel Engage Equip. Allocated
MG 100-120cv	31	0	31
MG 70cv	4	0	4
Camion Citernes Tanker Trucks	19	3	22
Camion Benne Dumptruck	19	7	26
Tracteurs Tractor	17	3	20
Camions Pouit a Temps Patching truck	6	6	7+5(Temporaires)12
Camions de Servitude Service truck	23	0	23
Chargeurs. Loader	8	1	8+1(Temporaire)9
Bulldozer	8	2	9+1(Temporaire)10
Rouleau a Pneus Tracte Rollers	15	3	18
Rouleau Vibrant 600kg Vibrating Roller	6	6	7+5(Temporaires)12
Rouleau Cylindre Cylindrical Roller	6	1	7
Fauche Mecanique Grass cutter	2	0	2
Marg[illegible] Blaude Line painter	2	0	2
Betonniere Ciment mixer	0	7	7
Compresseurs avec equip complet Compressors complete with assessories	0	7	7

Personnel	Chef d'Equipe Crew Chief	35	
	Pointeurs Inspectors	8	
	Macons occasionnel		21
	Menuisiers		
	Peintres		
	Manoeuvre specialites		76
	Manoeuvre Ordinaires		160
	Total		278 (fixe)+ 21 (occasionnel)=299

Tableau 8-f
Table 8-f

SENEGAL

COMPOSITIONS DES EQUIPES D'ENTRETIEN
Composition of maintenance groups

Matériel Equipment	Travaux généraux general	Reprofilage et recharge-grading and partial graveling	Reprofilage Grading	Buttage Ripping	Point à temps Patching	Fauchage mécanique ditching	Recharge- resurfacing graveling	Signalisation horizontale
MG 100-120 CV	1	2	2	-	-	-	2	-
MG 70 CV	-	-	1	-	-	-	-	-
Camion citerne tanker tracks	1	1	-	-	-	-	3	-
Camion benne Dump truck	1	2	-	-	-	-	-	-
Tracteur Tractor	1	1	-	-	-	1	1	-
Point à temps Patching unit	-	-	-	-	1	-	-	-
Camion servitude service truck	1	-	1	-	1	1	1	1
Chargeur Loader	-	1	-	-	-	-	1	-
Bull Bulldozer	-	-	-	1	-	-	1	-
Rouleau tracté Tracked roller	1	1	-	-	-	-	1	-
Rouleau vibrant 600k Vibrating roller	-	-	-	-	1	-	-	-
Rouleau cylindre Cylindre	-	-	-	-	1	-	-	-
Fauchage mécanique Grass cutter	-	-	-	-	-	1	-	-
Marqueur bande Line painter	-	-	-	-	-	-	-	1

Tableau 8-g
Table 8-g

SENEGAL

CREDITS VOTES 1963/1977 AVEC KILOMETRAGE DE ROUTES CORRESPONDANTES
Funds voted for road maintenance compared with kms of network 1963/1977

Année Budgétaire Fiscal year	Kilométrage routes revêtues paved roads (kms)	kilométrage routes en terre - earth roads (kms)	Crédits votés Funds voted (millions de FCFA)	Prévision Louis Berger ou Projet de budget pré-senté
1963	1 260	7 798	800	Louis Berger Budget (forecast or submitted budget)
1965 / 1966			761	-
1966 / 1967			635	-
1968 / 1969			630	-
1969 / 1970			645	-
1970 / 1971	2 130	6 928	710	1 303
1971 / 1972			726	1 471
1972 / 1973			686	1 755
1973 / 1974			776	1 880
1974 / 1975	2 496	6 562	891	1 160
1975 / 1976			1 025	1 490
1976 / 1977			1 179	1 540
1977 / 1978	2 591	6 467	-	1 594 (1 831)

Tableau 8-h
Table 8-h

SENEGAL

REGRESSION DU BUDGET D'ENTRETIEN 1963-1975
Decline of Maintenance Budget

Année budgétaire Financial year	Kilométrage Routes revêtues paved roads	- kilomèters Routes en earth roads	Montant Amount (millions de F CFA)	Montant actualisé par km de route revêtue - amount in current prices per km paved road (millions FCFA/km
1963	1 260	7 798	800 (voté -voted)	0,288
1973			776 (voté)	
1974	2 496	6 562	891 (voté)	
1975	2 496	6 562	1 490 (demandé reguest)	0,255

Les calculs ont été fait en admettant que l'entretien d'une route revêtue coûte environ 2 fois plus qu'une route en terre. Le km route revêtue = 0,255

Le km route en terre = 0,127

The calculations were made on the basis of paved road maintenance being twice as expensive as earth road maintenance. Paved = 0,255 million/km

Earth = 0,127 million/km

Tableau 8-i
Table 8-i

SENEGAL

COUTS DIRECTS UNITAIRES - 1976
Unit direct costs

	Rechargement (resurfacing)	Point à temps (patching)	Fauchage mécanique (mechanical ditching)
Salaires et indemnités de la main d'oeuvre (labor costs)	Epaisseur 4,56 cm (width) 15 380	10 310	445
Fourniture matériaux (materials)	-	64 745	-
Transport de matériaux (5 kms) (materials)	36 940	4 325	-
+ Location de matériel à la journée d'utilisation (prix PCM 1975/1976 (daily equipment rental)	141 140	21 220	4 105
Total coût/km avec amortissement (cost/km with depreciation) TTC	193 460	100 600	4 550
++ Coût de fonctionnement du matériel (equipment operating cost)	90 050	13 540	2 620
Total coût/km sans amortissement TTC (cost without depreciation)	142 370	92 920	3 065

+ location amortissement compris
++ location sans amortissement

Source : Etude d'Entretien Routier, Louis Berger, avec prix actualisés

Tableau 8-j
Table 8-j

SENEGAL

BUDGET D'ENTRETIEN ROUTIER DU SENEGAL
Road Maintenance Budget of Senegal

Années (years)	BUDGET PARTIEL (sans ouvrages, bacs et fonctionnement des arrt.) (without bridges ferries, and operation of arrt.)			Budget demandé Reguested budget	BUDGET COMPLET Crédits votés - funds voted					Prévision Etudes Berger (forecost of Berger studies)
	Régie (foreeoc count)	Entreprise (contract)	Total		Régie (foreeoc count)	Entreprise (contract)	Ouvrages bacs, arrt (bridges ferries, arrt.)	Total	Aug% (iner %)	
1970-1971	-	-	-					710	100	1 303*
1971-1972	-	-	-					726	102	1 474*
1972-1973	-	-	-					686	97	1 755*
1973-1974	-	-	-		316	243	217	776	109	1 880*
1974-1975	344++	269	613++	1 160	358	330	203	891	125	1 160
1975-1976	372++	340	712++	1 800	455	349	231	1025	144	1 490
	550++	340	890+	-	-	-	-	-	-	-
1976-1977	675	385	1 060	1 710**		390		1179	165	1 540

* Compris les frais d'assistance technique et la partie des travaux de réhabilitation principaux qui ne sont pas encore terminés (including technical assistance costs and part of rehabilitation works which havenot been finished)

** Répartition entretien en Régie 675 - Entreprise 720 - Bacs 70 - fonctionnement arrt. 145 (breakdown of maintenance - Foreeoccount 675 - Contract 720 - Ferries 70 - operating costs of arrt. 145)

\+ le salaire des temporaires n'est pas compris (salaries of temporary employees not included)

++ prix de fonctionnement du matériel sans amortissement - salaires des temporaires non compris (operating cost for equipment without depreciation or wages of tempory employees)

Table 8 - k

SENEGAL

PROPOSITION DE PROJECTION DU BUDGET DE L'ENTRETIEN ROUTIER
Proposed forecast of road maintenance budget
DANS LE CADRE DU PLAN QUADRIENNAL - 1976/77 - 1981/82
(In 5 year plan framework)
(million de FCFA)

ıfinition	1976-1977	1977-1978	1978-1979	1979-1980	1980-1981	1981-1982
rigie* by force account)	675	915	1185	1460	1708	1894
r entreprise** by contract)	720	763	808	856	906	958
- encadrement)	145	153	162	172	183	195
ıt arrondissements f arrondissements)						
retien) (maintenance)	1540	1831	2155	2488	2707	3047
·t (drainage structures)	100	106	112	119	126	133
ıt bacs (ferries)	70	74	78	83	88	93
	170	180	190	202	214	226
	1710	2011	2345	2690	3011	3273

ojection tient compte dans l'estimation de l'entretien en régie de l'accroissement progressif du parc PCM (Parc Central teriel) en e gins routiers et véhicules jusqu'à l'effectif total prévu à l'Etude du programme quadriennal d'entretien er. (The fc ecast takes into account increases in the equipment fleet up to the total forecast in the 4 year enance progr m)

s revêtus p ix 1976/77 entretien en régie 77000 FCFA le km. (Paved roads costs of maintenance by force account)

s non revetu s (unpaved roads) 149000 FCFA le km

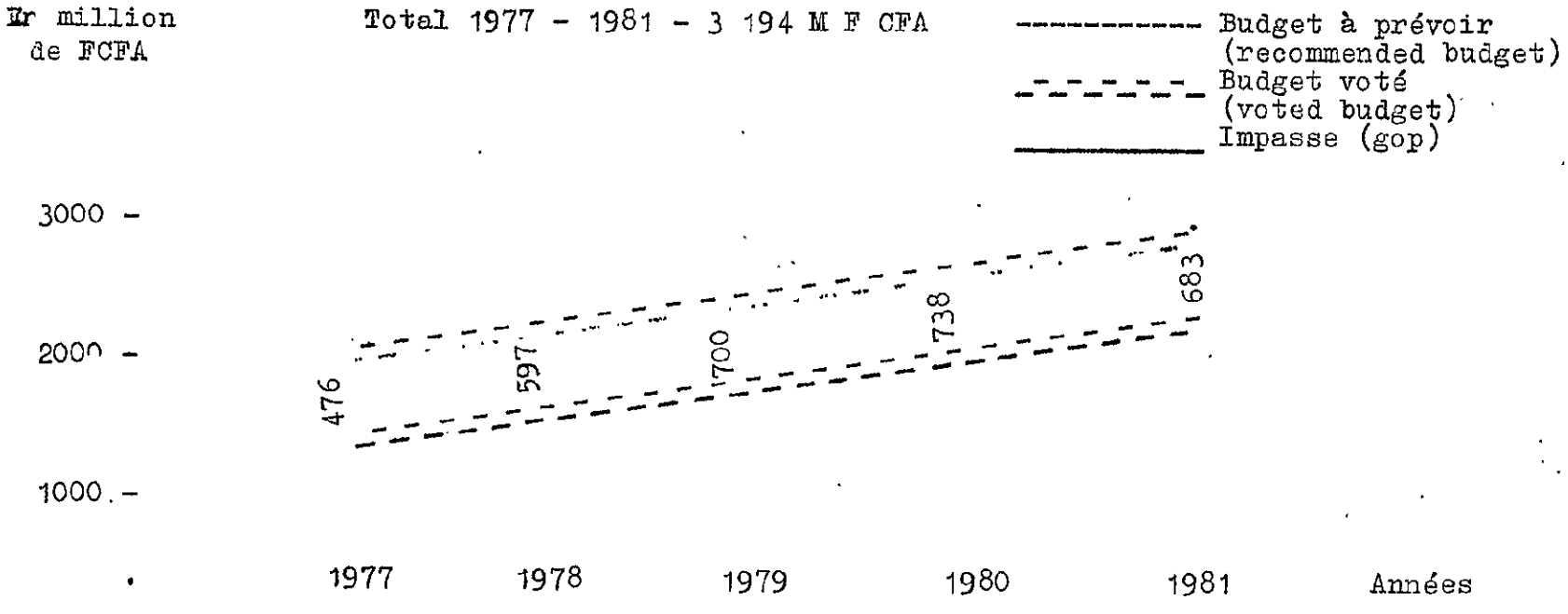
s revêtus p 1976/77 entretien entreprise 28200 FCFA le km (paved roads costs of maintenance by contract).

s années s ultérieures les prix ont été calculés en fonction d'un taux d'inflation de 5% et de l'évolution du kilometrage ... prix ...

Tableau 8-1
Table 8-1

SENEGAL

EVOLUTION DE L'IMPASSE BUDGETAIRE
(Growth of the budget gap)



Le budget voté a été calculé en prenant une augmentation de 15 % par an
(the voted budget was calculated by using a growth of 15 % per year)
en conformité avec l'accroissement de ce budget pendant les années 1974-1976
(in conformité with the growth of the budget during 1974-1976)

UPPER VOLTA

9.1 Summary

The Upper Volta road network is not expected to expand from its present size of 8700 km. However, the paved road element will increase by 150% to 2000 km by 1982. This network is maintained by two agencies: the SERN for 4460 km of national roads and the SERS for the secondary road network.

Present maintenance of national roads is operating at 50% of its normal level, and the budget has not increased in real terms since 1973, although it increased to a high of 650 million FCFA in 1977. Secondary road maintenance under the SERS will start in 1977.

The proposed minimum maintenance program includes rehabilitation of about 2000 km of earth roads, and an increase in the annual operating budget of 200% to 1265 MFCFA in 1977 prices. This would increase the total maintained network to 59% of the total including all improved roads. A total investment of 800 MFCFA is required including spare parts, and equipment for two SERS units of which one is already financed, and a proposed paved road resurfacing unit.

9.2 The Network and Its Traffic

9.2.1 Network and traffic in 1977

The principal network (see Table 9-a) is composed of 8702 km which includes 4460 km (51%) national roads with 857 km (19%) paved roads, 919 km of modern earth roads (21%), 1396 km of improved track, (31%) 1288 km of ordinary earth track and 4242 km of secondary roads (79% ordinary track).

The number of kilometers of road by traffic level is also shown in Table 9-a.

9.2.2 Network and Traffic in 1982

The total road network in Upper Volta is not scheduled to expand in the period 1977-1982. A 150% increase in the number of paved roads is expected, however, as well as an increase in the total km of ordinary roads. (Table 9-b)

The forecast traffic levels are for 1982 by road type are also shown.

9.3 Present Maintenance - Organization, Resources, Methods

9.3.1 Organization

The maintenance of national roads is the responsibility of the SERN and secondary roads are the responsibility of the SERS as shown in Figure 9-c.

SERN The SERN is financed by the Road Fund which was established in 1972. The SERN presently improves 150 km of road per year as well as maintaining 4310 km, using two construction units and four subdivisions with ten districts.

The present insufficient budget reduces the improvement from a desired level of 250 km/year. (Second Equipment Plan 1972-1976)

At the end of 1977, 1280 km of the unimproved network was improved or resurfaced or 65%. The rate of reshaping was about 6000 km/yr in light reshaping and 2700 km in heavy reshaping, for a total of 8700 km (51% of forecast)

Road paving and construction are contracted through the New Works Arrondissement.

It should be noted that a specific paving unit will be created which would handle patching, levelling, local reinforcement and periodic maintenance.

SERS The maintenance of secondary roads will be handled by the SERS. This service has started to function under IBRD financing. It is being initially constituted from two road brigades which were working on Cotton road and ORD road projects. These are being complemented by additional equipment and two other brigades including:

- 1 for SERS proper
- under SERS' authority, but initially allocated to an IBRD-sponsored rural development project where farm-market roads must be improved.

The program for these brigades includes for three years:

Maintenance	1200 km
Improvement	2300 km
	3500 km

9.3.1.2 Personnel

The SERN personnel includes 79 Agents Techniques, while 54 are to be posted to the SERS.

The distribution of this personnel is given in Table 9-d including those of the Directorate of Public Works, the Tools and Equipment Division and the Subdivisions for a total of 918 persons.

9.3.2 Present maintenance

The maintenance of national roads has declined in the total number of kilometers maintained in each type of operation between 1973 and 1976. In 1977 these operations came back to the 1973 level. The effects of this lack of budget were felt in the level of deterioration of the network, in the reduction of periodic maintenance and by the immobilization of a part of the vehicle fleet due to a lack of spare parts. The total effect is an estimated maintenance at 50% of the normal level desired by Public Works.

The maintenance of secondary roads by the SERS has not yet started and deterioration of these roads continues.

9.3.3 Workshop and equipment

Upper Volta's mechanical and equipment management and repair responsibilities rest with the Mechanical Division (DOM) of the Public Works Directorate. The DOM possesses the systems and capacity for sound equipment management planning. Its record-keeping is remarkable. However, the effective operation of the DOM and its annex workshops is hindered by both budget and personnel constraints.

The equipment fleet consists of some 450 units with a relatively high degree of standardization, thereby simplifying the stores (spare parts) supply system. The present value of the fleet is estimated at 3.3 million CFA. However, the volume of spares required far exceed supply, as determined by budgetary constraints. The annual spares purchase budget is about 3.1% (102 m CFA) of equipment acquisition cost versus the necessary 10% (330 m CFA). This parts shortage results in a deadlined fleet of about 40%.

If the spare parts budget can be increased to the required 10% level, fleet availability could approach the desired 80%. In 1977, taking existing parts inventory into account, a budget supplement of 160 million FCFA is required.

9.4 Unit Costs

Unit costs for the various tasks of road maintenance were calculated from a detailed breakdown of cost elements, personnel, equipment and materials costs. The results are summarized in Table 9-e.

9.5 Rehabilitation Requirements

9.5.1 Immediate requirements

These are shown in Table 9-f. They are those roads which have deteriorated to a state of seasonal track. The program of the SERN and the SERS in the next few years has not taken them into account. The quantity of work is 628 km for national roads and 400 km of secondary roads.

9.5.2 Minimum program

This is also shown in Table 9-f. The breakdown is 680 km for national roads and 434 km for secondary roads. The programming is for the rehabilitation of an annual average of 250 km per year for both categories of road. However, the resources of the SERS will be sufficient for the rehabilitation of 700 km per year in 1979. Therefore, a greater production rate was forecast for the years 1979 and 1980. Then the assumption was made that the SERS crews would be assigned the construction of new roads.

9.6 Maintenance Requirements

9.6.1 Immediate maintenance

This category is essentially comprised of spare parts to put the existing equipment back in working order. This applies particularly to the SERN. Clearly an increase in the road maintenance budget is required as well to meet immediate maintenance requirements, including periodic maintenance.

9.6.2 Minimum program

In addition to a budget increase the Upper Volta government has programmed the operation of four secondary road

teams which will both improve and maintain the secondary roads. This program will start in 1977.

For national roads the SERN has also forecast the creation of a paving unit to handle periodic paved road maintenance.

The basic minimum budget shown in Table 9-g was calculated from the length of network to be maintained as shown and a cost per km without taxes and depreciation.

9.7 Proposed Minimum Maintenance Program

9.7.1 Operating budget

The operating budget was calculated starting from the present budget (600 million FCFA), increasing in a linear manner to the 1982 budget level. Rehabilitation is programmed to peak in 1979 and 1980 as shown in Table 9-h.

Foreign financing was assumed to include 100% of rehabilitation costs (without taxes) and 50% of equipment replacement (depreciation).

9.7.2 Investment budget

The investment program includes spare parts and equipment for two SERS teams and one paving unit. These are shown in Table 9-i. The paving unit is programmed for 1978, whereas the SERS units are already supplied in the 1977 investment plan.

9.8 Training and Technical Assistance

A training program is described in Table 9-j which complements the present personnel resources.

The present level of technical assistance would also be increased by four additional experts to aid in the operation of the new units.

Tableau 9-a
Table 9-a

HAUTE VOLTA

RESEAU ROUTIER ET SON TRAFIC 1977
Road network and traffic 1977
(en kilomètres)

Classement/type de route Classification and type of road	Bitumée paved	terre moderne improved earth	terre ordinaire ordinary earth	piste améliorée improved tracks	piste ordinaire ordinary tracks	total
Réseau total total network	857	-	1205	2864	11 536	16 462
Réseau affecté aux autorités network under ministry	857	-	1205	1988	4 652	8 702
Réseau entretenu en % % of network maintained	100 %	-	100 %	52 %	12 %	42 %
Trafic - traffic véhicules/jour vehicks:day						
10				407	3 594	4 001
10 - 30				547	522	1 071
30 - 60			260	347	200	807
60 - 100			76	489	92	657
100 - 200	482	-	617	196		1 295
200 - 400	375	-	252			627
400						
Routes nationales national roads	857	-	919	1396	1 288	4 460
Routes départementales Departmental roads	-	-	160	210	1 550	1 920
Routes régionales Regional roads	-	-	126	382	1 814	2 322
Routes non classées non classified roads	-	-	-	876	6 884	7 760

Source : 1 rapport BCEOM 1975-76
1 consultation aux services des TP.

Tableau 9-b
Table 9-b

HAUTE VOLTA

RESEAU ROUTIER ET SON TRAFIC 1982
Road network and traffic 1982
(en kilometres)

Classement/type de route classification and type	Bitumée paved	terre moderne improved earth	terre ordinai ordinary earth	piste amélio -rée improved track	piste ordinaire ordinary tracks	TOTAL
Réseau total total network	2089	-	495	2741	11137	16462
Réseau affecté aux autorités (network under ministry)	2089	-	495	1865	4253	8702
Réseau entretenu (maintained network)	100%	-	100%	69%	30%	59%
Trafic - veh/jour (ADT)						
10				174	2113	2287
10 - 30				407	880	1287
30 - 60				929	874	1803
60 - 100			251	204	294	749
100 - 200	847	-	76	115	92	1130
200 - 400	1011	-	98	36		1145
400	231	-	70			301
Routes nationales national roads	2089	-	209	874	1288	4460
Routes départementales departmental roads	-	-	160	359	1401	1920
Routes régionales regional roads	-	-	126	632	1564	2322
Routes non classées non classification roads	-	-	-	876	6884	7760

Tableau 9-c
Table 9-c

HAUTE VOLTA

ORGANIGRAMME DE LA DIRECTION DES TRAVAUX PUBLICS

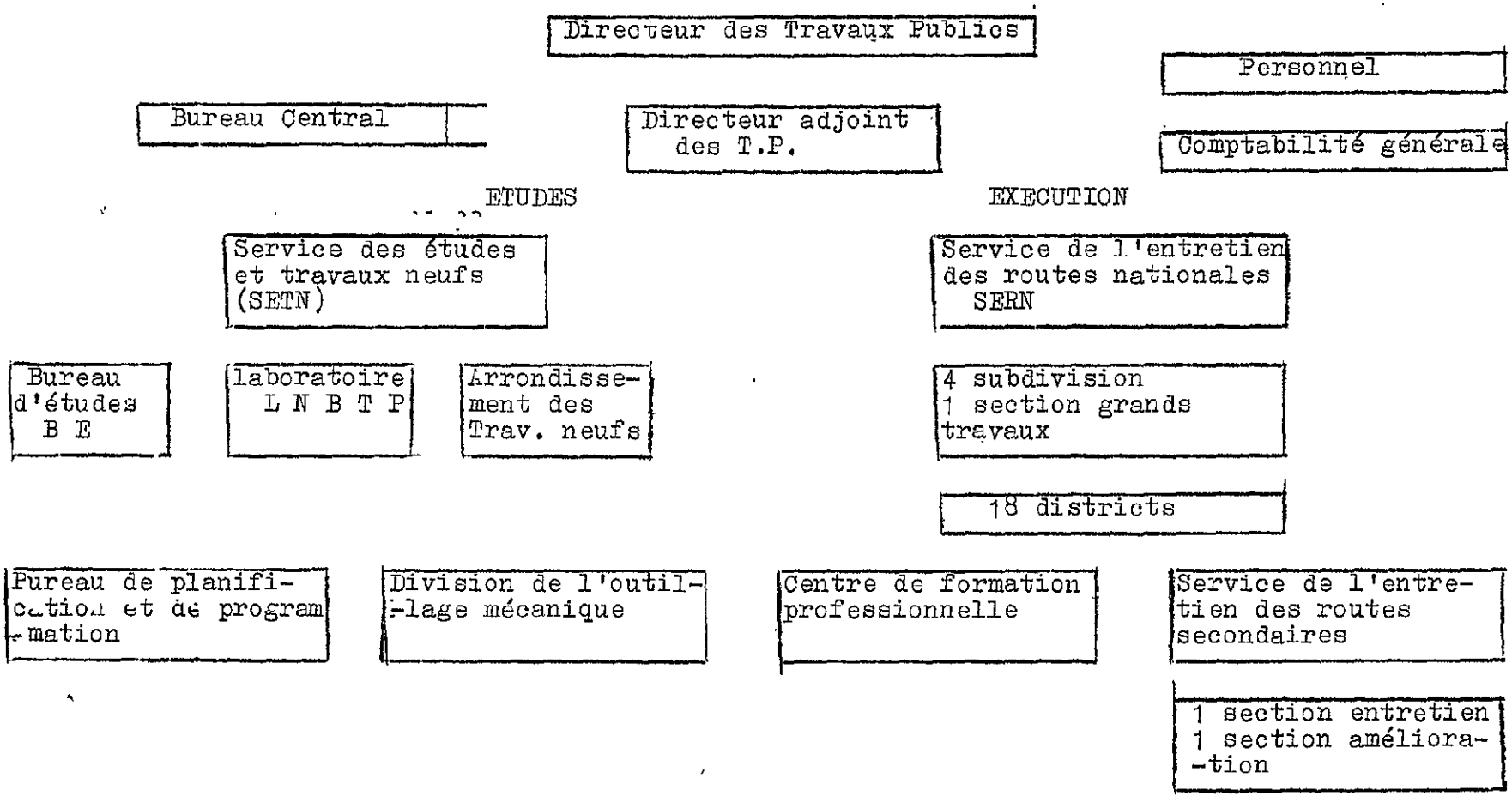


Tableau 9 - d
Table 9 - d

HAUTE VOLTA

ENTRETIEN ROUTIER - PERSONNEL EXISTANT (1/2-1977)
ROAD MAINTENANCE - EXISTING PERSONNEL (1/2-1977)

signation tegory	DTP	SERS	SERN	SUBDIV OUAGA	SUBDIV BOBO	SUBDIV OUAHIG	SUBDIV FADA	DMM	TOTAL
Ingénieurs & Administrateurs Engr. & Administrators	3	4	2	1	1	0	1	0	12
Techniciens	5	4	2	0	1	1	0	6	19
Agents de maitrise et personnel qualité Supervisors and Foreman	5	4	6	4	7	3	4	32	65
Personnel specialisé Skilled Labor	26	39	64	64	78	69	98	132	570
Manoeuvres Laborers	5	3	63	54	54	51	17		252
Total Général	44	54	79	132	141	127	154	187	918

- Direction des Travaux Publics
S - Service d'Entretien Routes Secondaires
N - " " " "Nationales
- Division de l'outillage mecanique

Tableau 9-e
Table 9-e

HAUTE VOLTA

RESUME DES COUTS UNITAIRES MOYENS
Summary of auerage unit costs
(F CFA/Km)

Tâche Task	routes bitumées (paved roads) 1		routes en terre (improved earth) 2		pistes amélio-rées (improved tracks) 3	
	TTC with tax	HT w/o tax	TTC with tax	HT w/o tax	TTC with tax	HT w/o tax
a) entretien minimum (minimum maintenance)						
le cantonnage (manuel maintenance)	80,200	72,900	72,200	65,500	41,200	37,200
2. Reprofilage léger (light reshaping)	-	-	6,500	5,300	6,500	5,300
3. Reprofilage lourd (heavy reshaping)	-	-	38,600	31,400	-	-
4. Rechargement (resurfacing earth)	-	-	310,100	252,700	62,000*	50,600*
5. Reflachage+ (paved patching)	61,000	47,000	-	-	-	-
6. Revêtement+ (bitume) (paved resurfacing)	420,000	315,000	-	-	-	-
b) réhabilitation ++						
1. routes en terre	-	-	4,00M	3,00M	2,60M	1,95M

1. hypothèse trafic 30 véh/jour (ADT)
2. " " 80 " "
3. " " 250 " "

\+ estimé à partir des coûts pour une unité de bitumage (estimated from paving unit costs)

++ estimation égale a 1/4 du coût de terrassement dans le coût de la construction (estimate égual to 1/4 of the earth works cost for construction)

* localisée (localised)

Tableau 9-f
Table 9-f

HAUTE VOLTA

BESOINS EN REHABILITATION
Rehabilitation Requirments

Désignation route Name of road	Classement Classification	longueur km length	Trafic V/j (ADT)	Coût/ Km cost/km (MFCFA)	Coût total TTC (MFCFA) with taxe	HT wo taxe
		I - BESOINS IMMEDIATS - Immediate needs				
TOUGOURI - Fr NIGER	RN3	145	30-40	4,00	580,	435
ORODARA - GAOUA	RN11	233	40	"	932,	699
SEGUENEGA - KAYA	RN15	112	40	"	448,	336
FADA - Fr BENIN	RN18	138	20	"	552,	414
PISTES SECONDAIRES+ (secondary tracks)	RD-RR	400	20	2,60	1040	780
TOTAL		1028			3552	2664
		II - BESOINS MINIMUM - Minimum needs				
DIEBOUGOU - LEO	RN6	135	10-30	4,00	540	405
NAMOUNOU - TINDANGOU	RN19	129	10	"	516	387
NOUNA - MALI	RN14	84	10	"	336	252
YAKO - Fr GHANA	RN13	242	30-200	"	996	747
PISTES SECONDAIRES+ (secondary tracks)	RD-RR	434	20	2,60	1128	846
TOTAL		1024			3516	2637

+ en raison du nombre élevé des routes secondaires, elles ne sont pas présentées ici en détail.
- le coût de réhabilitation par km est estimé à partir de travaux actuellement en cours en Haute Volta (1/4 des coûts de terrassements) 4 000 000 F CFA le RN 2 600 000 F CFA pour les pistes secondaires
- le coût HT a été pris égal à 0,75 TTC
- la part en devises étrangères a été estimée à 0,60 TTC

Tableau 9 - g
Table 9 - g

HAUTE-VOLTA

BUDGET MINIMUM DE FONCTIONNEMENT - 1982

MINIMUM OPERATING BUDGET - 1982

	Longueur (length) (km)	Coût/km (Cost/km) (FCFA)	Coût Total (Total Cost) (m FCFA)
1. SERN			
a) Routes bitumées (paved roads)	2 089		
i) Entret. courant (routine maint.)		51.800	108.2
ii) Entret. périodique (Periodic Maint.)		252.000	526.4
b) Routes en terre (earth roads)	495		
i) Entret. courant (routine maint.)		50.300	24.9
ii) Entretien périodique (periodic maint.)		179.400	88.8
c) Pistes améliorées (improved tracks)	1 876		
i) Entret. courant (routine maint.)		30.200	56.7
ii) Entretien périodique (periodic maint.)		36.000	67.5
TOTAL SERN	4 460		872.5
2. SERS (entretien)	3 300		
a) Entretien courant (routine maintenance)		30.200	108.9
b) Entretien périodique (periodic Maint.)		36.000	118.8
Total SERS			227.7
Frais Généraux (15 %) (overhead)			165.0
3. TOTAL GENERAL			1 265.2

+ Coût HT sans amortissement - Costs without tax or depreciation (20-29%)

Tableau 9 - h
Table 9 - h

HAUTE-VOLTA

PROGRAMME MINIMUM D'ENTRETIEN

MINIMUM MAINTENANCE PROGRAM

(millions FCFA)

	1977	1978	1979	1980	1981	1982
1. Entretien courant et périodique (Routine and periodic Maint.)	600	730	860	995	1130	1265
2. Rehabilitation +	260	1440	2520	2520	720	-
3. Amortissement (Depreciation)	250	610	940	950	460	290
Total (FCFA constant)	1110	2780	4320	4465	2310	1555
Facteur d'inflation (inflation factor) 10 %	1.0	1.10	1.21	1.33	1.46	1.61
Total (FCFA courant) (inflated FCFA)	1110	3058	5227	5938	3373	2504
4. Participation Extérieure						
a) 100 % des coûts de réhabilitation HT	260	1440	2520	2520	720	-
b) 50 % d'amortissement (50 % of depreciation)	125	305	470	475	230	145
Total (FCFA Constant)	385	1745	2990	2995	950	145
Total (FCFA Courant)	385	1920	3618	3983	1367	233
5. Budget Réel Minimum (True Min. Budget)	725	1138	1702	1955	1986	2271

+ Basé sur un échellonnement de km : 100-1977, 400-1978, 700-1979/80, 200-1981
(Based on a staging of)

TABLEAU 9 - i

Table 9 - i

HAUTE-VOLTA

PROGRAMME D'INVESTISSEMENT

INVESTMENT PROGRAM

(MILLIONS FCFA)

	1977	1978	1979	1980	1981	1982	TOTAL
1) Achat de pièces détachées (Spare farts purchose)	160	-	-	-	-	-	160
2) Unité SERS (SERS Unit)	500	-	-	-	-	-	500
3) Unité débitumage (Paving Unit)	-	209	-	-	-	-	209
4) Assistance Technique*	3	6	3	-	-	-	12
TOTAL	660	215	3	-	-	-	881

* 1 conducteur de travaux et 1 chef mécanicien par unité.
(1 crew supervisor and 1 chef méchanic per unit).

TABLEAU 9 - i,

TABLE 9 - i,

HAUTE - VOLTA

FORMATION POUR L'ENTRETIEN ROUTIER ET LE MATERIEL - (EN COURS)

EQUIPEMENT AND ROAD MAINTENANCE TRAINING - (IN PROGRESS)

POSTES POSITION	QUALIFICATION	LIEU DE FORMATION PLACE OF TRAINING	NOMBRE NUMBER	ANNEE DE SORTIE YEAR OF COMPLETION
Directeur T P	Ingénieur TP	FRANCE	1	1978
Chef Subdivision	Ingénieur TP	FRANCE	1	1977
DOM	Ingénieur mécanicien	URSS	1	1977
Adjoint DOM	Ingénieur mécanicien	FRANCE	1	1978
SERN	Ingénieur TP	CANADA	1	1977
Service Topographie	Ingénieur Géomètre	FRANCE	1	1977
Arron. Travaux Neufs	Ingénieur TP	FRANCE & MALI	2	1978
Bureau Etudes et progr.	Ingénieur TP	FRANCE	2	1978
Contrôle Travaux rout.	Ingénieur TP	C.E.E.	1	1982
DOM	Technicien supérieur	FRANCE	3	1978 & 1981
Contrôle travaux	Technicien TP	C.E.E.	2	1980 & 1982
Chef équipe DOM	Ouvrier qualifié	NIGER	1	1977
Chef antenne DOM	Ouvrier qualifié	AFCOPA FRANCE &SUISSE	2	1977 & 1978

TABLEAU 9 - j, (suite)

TABLE 9 - j, (continued)

POSTES	QUALIFICATION	LIEU DE FORMATION	NOMBRE	ANNEE DE SORTIE
Electricien DOM	Ouvrier qualifié	AFCOPA FRANCE	1	1977
Menuisier DOM	Ouvrier qualifié	ALLEMAGNE	1	1978
Mécanicien DOM	Ouvrier 3 à 5° catég.	CERFER LOME	5	1977
Chef antenne DOM	Ouvrier principal	Promotion C.F.P.	2	1977
Spécialiste injection	Ouvrier qualifié	OUAGADOUGOU	1	1977
Mécanicien et aide	Ouvrier qualifié	OUAGADOUGOU	2	1977
Chef antenne	Ouvrier qualifié	Promotion C.F.P.	2	1978
Mécanicien	Ouvrier qualifié	OUAGADOUGOU	2	1978
Aide-Mécanicien	Ouvrier qualifié	OUAGADOUGOU	2	1978
TOTAL.....			37	

Total :

Ingénieurs TP et mécanique	11
Techniciens supérieurs	5
Ouvriers qualifiés	21

C.F.P. = Centre de formation professionnelle des TP, OUAGA

CERFER = Centre de perfectionnement de LOME - TOGO