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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

INTERNATIONAL DEVELOPMENT ASSOCIATION

APPRAISAL OF

A HIGHWAY ENGINEERING PROJECT

TUNISIA

May 12, 1969

Transportation Projects Department

CURRENCY EQUIVALENTS:

Currency Unit:	Dinar (D)
US$1	= D 0.525
D 1	= US$1.905

Fiscal Year:

July 1 to June 30

Weights and Measures: Metric

Metric: British/US Equivalent

1 kilometer (km)	= 0.62 miles (mi)
1 meter (m)	= 3.28 feet (ft)
1 hectare (ha)	= 2.47 acres (ac)
1 liter (l)	= 0.22 imp. gallons
	= 0.26 gallons (US)
1 metric ton (m ton)	= 2,204 pounds (lbs)

ABBREVIATIONS - ACRONYMS

BCEOM	-	Bureau Central d'Etudes pour les Equipments d'Outre-Mer
DPW	-	Directorate of Public Works
GNP	-	Gross National Product
SCET	-	Societe Centrale pour l'Equipement du Territoire
SETEC	-	Societe d'Etudes Techniques et Economiques
UNDP	-	United Nations Development Program

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This report was prepared by Messrs. F. C. Soges (engineer) and L. Pouliquen (economist).

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SUMMARY

i. Tunisia has an extensive road network, but many roads are becoming inadequate for the rapidly growing traffic, particularly in the northeastern part of the country where there is a substantial increase of agricultural and tourist activity. The Government wishes to ensure that economic development will not be hampered by increasing transport costs, and to this end is proposing the reconstruction of certain road sections to higher standards and the improvement of highway maintenance. This road program has high priority in the country's 1969-72 development plan, and the Government has applied to the Bank for assistance in financing the program. The application is based on a transport survey in 1967-68 by consulttants (Italconsult), financed by the UNDP with the Bank as executing agency.

ii. The proposed project consists of the reconstruction of roads (340 km in total length) and of bridges on main routes radiating from Tunis to important agricultural and touristic areas, and of a highway maintenance and betterment program. As considerable engineering preparation is required before work can be started, financing of the project is proposed in two phases: an engineering loan which is the subject of the present appraisal and would be the first lending for roads by the Bank Group in Tunisia, to be followed by a possible construction loan in 1970. The total cost of the engineering project is estimated on the basis of the consultants' draft contracts at US$1.3 million equivalent, with a foreign exchange component of US$0.85 million equivalent. The cost of the possible construction phase would range from US$17-25 million equivalent, including foreign exchange ranging from US$10-15 million equivalent.

iii. The Directorate of Public Works under the Department of Public Works and Housing will be responsible for the execution of the project. The engineering of roads and bridges and the preparation of the maintenance program will be by two firms of French consultants (SETEC and SCET-BCEOM). The consultants' draft contracts were approved by the Bank in May 1969, and the engineering should be completed by mid 1970.

iv. The economic justification stems from the need to adapt the road network to a fast growing traffic demand, and to prevent rising traffic congestion and further deterioration of the roads from hampering the economic development of the country. While further economic studies are required to refine the design of the various elements of the project, an analysis of the consultants' preliminary proposals indicates that the engineering project should lead to a construction and maintenance project which will yield a satisfactory economic return.

v. The engineering project provides a suitable basis for a Bank loan of US$0.85 million equivalent. The proposed term of the loan is 10 years including a two-year grace period. Refunding of the engineering loan should be considered in the case that the construction loan is made.

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APPRAISAL OF A HIGHWAY ENGINEERING PROJECT

1. INTRODUCTION

1.01 Upon the recommendation of a Bank economic mission in 1966, a comprehensive survey of the transportation sector in Tunisia was carried out in 1967-68 by consultants, Italconsult (Italy), with the financial assistance of the UNDP and the Bank as executing agency. Arising out of this survey, the Government of Tunisia applied to the Bank in June 1968 for assistance in financing a road improvement program to which the Government is giving high priority in its 1969-72 development plan. After a thorough review of the consultants' draft report, a Bank mission went to Tunisia in December 1968 to discuss the draft with the Government and the consultants, and to identify, if possible, a highway project for Bank appraisal.

1.02 The mission identified a project consisting of (i) the reconstruction of five primary and two secondary roads (340 km in total length), (ii) the reconstruction of 16 bridges and a number of culverts, and (iii) a highway maintenance and betterment program. However, the mission found that considerable engineering would be required before construction could start. Therefore, financing of the project is proposed in two phases:

(1) An engineering loan, which is the subject of this appraisal report, for the detailed engineering of the roads and bridges, and for the preparation of the highway maintenance and betterment program. The cost of this phase is estimated at US$1.3 million equivalent, with a foreign exchange component of US$0.85 million equivalent.

(2) A possible construction loan in 1970. The cost of this phase would range from US$17-25 million equivalent, including foreign exchange ranging from US$10-15 million equivalent.

1.03 The proposed engineering loan would be the first Bank Group lending to Tunisia for highways, and the fourth Bank Group operation for transportation development in Tunisia. In 1964 and 1968 loans of US$7.0 and 8.5 million equivalent respectively (380-TUN and 573-TUN) were made for port development. Construction of the project financed by the 1964 loan was satisfactorily completed in November 1967; work under the 1968 loan is proceeding on schedule. A railway project involving a loan and credit of US$17 million in total was approved by the Board of Executive Directors on April 29, 1969.

1.04 This appraisal report is based on the findings and recommendations of the Italconsult transport survey, information obtained from the Government and the French consultants BCEOM, and the findings of the December 1968 Bank mission consisting of Messrs. H. Young and F. Soges (engineers) and L. Pouliquen (economist).

2. BACKGROUND

A. General

2.01 Tunisia, with an area of 164,000 km^2, or about one-quarter that of France, is bordered by the Mediterranean to the north and east, Algeria to the west, and Libya to the south and southeast. Its population is about 4.5 million and is increasing at 2.3% p.a. The average population density of 27 inhabitants per km^2 is low because of the large areas of inhospitable mountains and deserts. In the north, particularly in the Tunis area, where economic activity is largely concentrated, the population density is considerably above the national average.

2.02 The gross national product (GNP) grew by about 4% annually between 1960 and 1967; in the latter year it amounted to US$963 million, or US$215 per capita. Agriculture contributed about 18% to GNP, but provided about one-half of total employment. The principal agricultural products are cereals, olives, vegetables, citrus fruit, grapes and wine. The share of agriculture has been declining as mining, manufacturing and tourism have grown more rapidly in recent years. Tunisia's first oil refinery was opened in 1963. A steel plant began production in 1964. Further industrialization, particularly light manufacturing, is being encouraged. The growing volume of tourists has stimulated building construction and associated activities. The principal sources of foreign exchange earnings are tourism and phosphate.

B. Transport System

2.03 The contribution of transport to the GNP has increased from about 6% in 1964 to about 7.5% in 1968, indicating the growing importance of the sector. In view of the higher than average growth of mining and tourism, which are two of the main generators of traffic movement, the rate of growth of the transport sector is expected to be about 8% a year, or higher than that of the GNP itself at about 6% a year.

2.04 Upon achievement of independence in 1956, Tunisia inherited an extensive transport system to which there have only been modest additions over the past decade. With a coastline of about 1,200 km, the country has four major commercial ports: Tunis-La Goulette, Bizerte-Menzel Bourguiba, Sfax and Sousse. Construction of a new deepwater port at Gabes for phosphate, the country's largest single export, started recently. The railway network is about 2,000 km long and is essentially used for bulk shipments. The main line extends from Bizerte in the north to Gabes in the south; five east-west links connect the main line and major seaports with phosphate and iron ore mining centers in the west and with Algeria.

2.05 An extensive road network of more than 15,000 km, over half of which is bituminous paved, radiates from Tunis, the capital, and interconnects the regions. The relatively high density of roads is in contrast with their generally poor condition. Many roads are becoming inadequate for the growing traffic, especially in the northeastern part of the country

where there is a continuing rapid growth of agricultural and tourist activity.

2.06 In the recent past, low priority was given to highway construction and maintenance which is reflected in the relatively low budgetary allocations over the past years (see Table 1). This policy has resulted in an obvious backlog of maintenance, and congestion is also beginning to develop on the roads carrying the highest traffic. If not taken care of now, the situation could lead to a further deterioration of the roads and a rapid increase of congestion which would seriously hamper the economic development of the country. This is particularly true of some of the roads which link rich agricultural areas with the main consumption center of Tunis, and which serve rapidly growing tourism.

2.07 The country has three international airports and about 30 small airfields. Internal air transport is insignificant. Improvements of the international airports which are now underway should provide sufficient capacity to accommodate the fast growing tourist and other international traffic through 1980.

C. Transport Policies and Coordination

2.08 The Government exercises strong controls over the whole transport sector. Approval of tariffs, licensing of routes, allocation of commodities, distribution of investments, appropriations of foreign exchange and taxation are all instruments of government control. Investment and policy decisions have been taken largely on an *ad hoc* basis, frequently without adequate economic analyses.

2.09 Fortunately, the absence of coordinated planning has not so far resulted in a substantial distortion of traffic allocation among the various modes. In the case of the ports and railways the major weaknesses concern tariffs and railway subsidies, which are being progressively corrected under the port and railway projects. In road transport, the key issue of reorganizing the trucking industry is under study by the Government. In general the Government is pragmatic in granting or tolerating exceptions to the more restrictive regulations. Transport policies are being further investigated by the Bank in connection with the review of Tunisia's 1969-72 four-year development plan. The Bank will then consult with the Government and agree in mid 1969 on economic policy and measures including transport policy which will form a condition of future lending operations in the transport sector.

D. Highway Organization

2.10 The Directorate of Public Works (DPW) under the Department for Public Works and Housing is responsible for the highway system. It has central divisions in Tunis for planning, engineering, construction, maintenance and equipment, and 16 regional divisions in the provinces. Authority over highway operations is highly centralized with the Chief Engineer of the DPW, who is also in charge of airports and of minor seaports. High positions are filled by a capable and devoted staff; however, there is a shortage of specialized personnel below management level.

2.11 The DPW has a large departmental construction force including an equipment pool, estimated at US$12 million, which has capacity for substantial civil engineering works but is not fully utilized. A large part of the equipment was obtained recently through USAID financing. Equipment maintenance and repair is centralized in the DPW's large shops in Tunis, which are run efficiently. This is in contrast with the small and inadequately equipped shops of the regional divisions.

E. Highway Maintenance

2.12 Highway maintenance is carried out by the DPW's central maintenance units and the regional divisions, but has been neglected over the past years and the condition of the highway system has progressively deteriorated. There are several reasons for this. Although the equipment pool is ample, a large part of it is of heavy construction type unsuitable for maintenance. The rate of utilization of the equipment is low because of insufficient operating funds and long delays in repairs due to shortage of spare parts. The regional divisions lack sufficient technical personnel, and funds and personnel officially allocated to highway maintenance are often diverted to other tasks, in many cases not highway works.

2.13 Consultants, BCEOM (France), have carried out a study of a regional pilot division with a view to improving the maintenance organization. The consultants recommend sweeping changes including decentralization of smaller equipment repairs, an increase of the technical personnel of the regional divisions, a clear definition of functions and lines of authority, the introduction of cost accounting, and the execution of betterment works as part of the maintenance operations. The conclusions clearly establish the need for a nationwide reorganization of highway maintenance. The detailed planning of this needed reorganization will be one of the major tasks of the consultants who will prepare the highway maintenance program under the proposed engineering project (see para. 3.05).

F. Highway Construction

2.14 Traditionally, highway construction was executed in Tunisia by departmental forces. However, the DPW's forces will be able to meet only a part of the construction program envisaged in the coming years, and the Government has agreed that the road and bridge works in the future construction project will be let to contract on the basis of international competitive bidding in accordance with the Bank's usual procedures. The maintenance and betterment works would be executed by departmental forces, or let to local contract. During negotiations for the engineering loan assurance was obtained from the Government that the above procedures will be followed in the event of the Bank financing the construction project.

2.15 The Government is proposing to convert a part of the DPW's forces into an autonomous public enterprise for construction works (Societe Nationale des Travaux Publics) and intends to prequalify it for international competitive bidding for Bank Group projects. The Government has been asked to submit to the Bank the proposal specifying the details of the constitution of the enterprise, and to establish the enterprise only after agreement is

reached. The Bank's requirements for agreement would include among others an independent external auditing of the enterprise, and the supervision of construction works by consultants on Bank projects. If established satisfactorily, the enterprise would probably only qualify for relatively small contracts, because of the limited experience of the DPW's forces. The Bank has also stressed that formation of the enterprise should not weaken the maintenance organization by taking over its equipment and personnel. The consultants who will prepare the highway maintenance program will also determine which part of the DPW's equipment should be assigned permanently to the maintenance organization. During loan negotiations the Government gave assurance that before the national construction company is formed, its articles of agreement will be agreed with the Bank, and that an adequate amount of DPW equipment will be retained for the highway maintenance organization.

3. THE ENGINEERING PROJECT

A. Description

3.01 The proposed project consists of:

(i) the detailed engineering, including the economic analysis of design options, and the preparation of tender documents and cost estimates of -

(1) five primary road sections (267 km in total length);

(2) two secondary road sections (75 km in total length); and

(3) 16 bridges and 41 culverts (see Map and Table 2);

(ii) the preparation of a highway maintenance and betterment program, including the improvement of the highway maintenance organization.

Detailed Engineering of Roads and Bridges

3.02 The list of the roads in the proposed project is based on the reconstruction and improvement program recommended in the Italconsult transport survey. All roads to be engineered are on trunk routes radiating from Tunis to Enfidaville-Kairouan, Pont du Fahs, Beja, Korba and Nabeul (for details, see Table 2). Although these roads are paved and in general have fair standards, improvements are required in many places to correct curves, profiles and cross sections, to provide adequate drainage, to improve visibility and to realign short sections which are winding or periodically flooded. The weakest point of the roads is the pavement structure which is over age and is breaking under present traffic. The pavement will require substantial rehabilitation and upgrading.

3.03 The detailed engineering will follow broadly the recommendations of the transport survey. However, the exact scope of the works, including the design standards and timing, must be determined specifically for each road section, on the basis of an independent economic evaluation by the engineering consultants. The design standards which will be defined in the course of the engineering of the project could likely serve as a basis for establishing general guidelines for road design in Tunisia.

3.04 The list of the bridges and culverts in the proposed project is based on a survey carried out by BCEOM in 1968 (see Table 2). The bridges and culverts are destined to replace structures which have already collapsed or have insufficient load capacity and/or dimensions. They are spread over various roads other than those included for engineering.

Preparation of a Highway Maintenance and Betterment Program

3.05 Under the proposed highway maintenance and betterment program the recommendations of the BCEOM pilot study will be applied to the entire network. The program will be for the three-year period 1970-72 and its preparation is included in the proposed engineering project. The terms of reference for consultants for the program preparation include the definition of day-to-day maintenance requirements, the identification and classification in order of priorities of the road sections which need betterment, the formulation of proposals for the strengthening of the maintenance organization to meet its tasks, including the training of personnel and the introduction of cost accounting, the determination of the part of the existing equipment which should be permanently assigned to maintenance and of new equipment and facilities which should be acquired (see para. 2.15), and the recommendation of a program of action with a financial plan. During loan negotiations the Government undertook to discuss with the Bank the consultants' recommendations, and on this basis agree on a program which could form part of the expected construction project (see para. 3.08).

B. Cost Estimates

3.06 The estimated cost of engineering services, including the foreign exchange component, is based on recently negotiated draft contracts with consultants, and is as follows:

	D 1,000			US$1,000 equivalent		
	Foreign	Local	Total	Foreign	Local	Total
Detailed engineering, roads	286	119	405	545	225	770
Detailed engineering, bridges	92	58	150	175	110	285
Maintenance program preparation	62	48	110	115	90	205
Totals	440	225	665	835	425	1,260
Rounded off	440	230	670	850	450	1,300

C. Execution

3.07 The DPW will be responsible for the execution of the project; the studies and engineering will be by consultants. The DPW has negotiated contracts with SETEC (France) for the detailed engineering of the roads and with SCET-BCEOM (France) for the preparation of the highway maintenance program and the detailed engineering of the bridges and culverts. The Bank approved the consultants' draft contracts in May 1969. The consultants are expected to mobilize in June 1969. The preparation of the maintenance program should be completed by March 1970 and the engineering studies by about May 1970.

3.08 The highway engineering loan is expected to yield a construction project, the total cost of which can best be estimated, on the basis of Italconsult's and BCEOM's preliminary estimates reviewed and adjusted by the Bank, as between US$17-25 million equivalent depending upon findings with respect to the most economic design options. The foreign exchange component would be in the range of US$10-15 million equivalent, or about 60%. The bulk of the construction project would consist of major road and bridge construction works, and the remainder of the procurement of maintenance equipment, foreign imports for betterment works, and consultants' services for the supervision of construction and of the highway maintenance and betterment program.

D. Financing

3.09 The amount of the proposed loan is US$850,000 equivalent, which would cover the foreign exchange requirements of the consultants' services. The Bank will finance the actual foreign exchange cost of the consultants' services. Any surplus funds remaining in the loan account would be cancelled on completion of the studies and engineering. Disbursement of the loan would be evenly divided between the years 1969 and 1970.

4. ECONOMIC EVALUATION

4.01 The economic justification of the project is based on extensive studies by Italconsult of traffic demand forecasts for the period 1968-1980. A detailed analysis, region by region, and commodity by commodity, shows that the contemplated 6% annual growth of GNP will induce substantial growth of road traffic, up to 10% per year in areas where important tourist development is expected. While the coverage of the road network is adequate to handle future flows, its condition is deteriorating, and on some important sections near Tunis congestion is building up. The main concern is to ensure that the road network will be able to serve future demand adequately and that the forecast economic development will not be hampered by rising transport costs. This strategy points to a project consisting of (i) reconstruction of certain roads to improved standards to avoid developing congestion, (ii) elimination of existing and foreseeable constraints due to collapsed bridges and other inadequate structures, and (iii) a maintenance and betterment program to prevent further deterioration of the road system. The road by road analysis which follows gives a general indication of the economic justification for the eventual construction project; however, further engineering and economic studies are necessary to refine and optimize the scope and standards of the works and to estimate the timing of construction.

4.02 The Tunis-Libyan border road (GP1) is the most important north-south link in Tunisia. Improvement of the Tunis-Enfidaville section is of high priority. The traffic ranges from 9,000 vehicles per day near Tunis to 2,100 vehicles per day at Enfidaville. On the basis of Italconsult's survey, passenger car and other light vehicle traffic makes up about 80% of the total traffic and trucks and buses the remainder. Light vehicle traffic is expected to grow at an average rate of 9% per year, and truck and bus traffic at an average rate of 5% per year. In view of the high agricultural and tourist potential of the area served by this road section, the forecasts appear reasonable. Reconstruction of the road to the standards proposed by Italconsult would yield an economic rate of return of about 11%.

4.03 The Enfidaville-Kairouan road (GP2) is in poor condition. Maintenance costs are high because of failing pavement and inadequate drainage. The traffic is about 500 vehicles per day and is expected to grow at an average rate of 6% per year. Reconstruction of the pavement and improvement of drainage, to standards somewhat lower than recommended by Italconsult, would yield an economic rate of return of 10%.

4.04 The Tunis-Beja (GP5-GP6) and the Tunis-Pont du Fahs (GP3) roads are major links with the rich agricultural areas west and southwest of Tunis. Traffic on these roads averages about 1,000 vehicles per day, and is expected to grow at an average rate of 8% per year for cars and 6% for trucks. Cars make up about 85% of the total traffic. Many sections are narrow and winding and improvements, including local realignments, would result in substantial speed increases. Savings are also expected to result from the improvement of the road surface. Reconstruction to the standard

recommended by Italconsult would yield an economic rate of return of at least 10% for the Tunis-Beja road, and 12% for the project section of the Tunis-Pont du Fahs road.

4.05 The Turki-Nabeul (MC27) and GP1 - Korba (MC26, 41, 42, 44) roads branch off the GP1 eastward into the agriculturally rich southern part of the Cap Bon area. The traffic varies between 2,200 vehicles per day on the MC26 and a low of about 500 vehicles per day on MC44. Traffic growth is expected to reach an average of about 8% per year for passenger cars and 6% for heavy vehicles. There is a high seasonal variation of traffic and serious congestion results during the harvest and tourist seasons. Improvement of these roads is expected to yield a 14% return.

4.06 An economic justification of the bridges has been carried out by BCEOM on the basis of preliminary cost estimates and benefits resulting from avoidance of time delays when the temporary structures replacing the bridges are flooded, and some savings in vehicle operating costs when these temporary structures can be used. Reconstruction of the bridges has been recommended when the first year benefit/cost ratio exceeded 10%. This justification has been carefully reviewed by the mission and found acceptable. In terms of rate of return and on the basis of a traffic growth of 3% per annum, reconstruction of each one of the bridges would yield at least a 13% rate of return over 30 years. This rate of return does not take into consideration benefits resulting from the increased reliability of travel, which are also considered to be significant.

4.07 The maintenance program to be prepared under the proposed engineering project is not yet defined accurately enough to permit a quantified evaluation of its economic return. Economic evaluation is, in fact, built into the consultants' study and the analysis of the trade off between maintenance expenditure, vehicle operating cost, and road reconstruction costs will form the basis of the consultants' recommendation. Because of the high benefits and relatively low capital expenditures involved in an appropriate maintenance operation this part of the project is expected to yield a high rate of return.

5. RECOMMENDATIONS

5.01 During loan negotiations satisfactory assurances were obtained from the Government that:

(i) in the event of the Bank Group financing the works under a future project, road and bridge construction will be let to contract on the basis of international competitive bidding (see para. 2.14);

(ii) before the national construction company is formed, its articles of agreement will be agreed with the Bank, and an adequate amount of DPW equipment will be retained for the highway maintenance organization (see para. 2.15);

(iii) the consultants' recommendations on the maintenance and betterment program will be discussed with the Bank, and on this basis agreement reached on a program (see para. 3.05).

The signature of the contracts with the consulting firms for the engineering and maintenance studies is a condition of the effectiveness of the proposed loan.

5.02 The project is suitable for a Bank loan of US$0.85 million. The proposed term of the loan is 10 years including a two-year period of grace. Refunding of the engineering loan should be considered in the case that the construction loan is made.

May 12, 1969

TABLE 1

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HIGHWAY ENGINEERING PROJECT

Highway Department Budgets

	Maintenance	Construction (millions of Dinars)	Total
1961	2.9	1.7	4.6
1962	2.8	1.2	4.0
1963	2.5	2.4	4.9
1964	2.6	0.4	3.0
1965	2.6	0.9	3.5
1966	2.5	1.4	3.9
1967	2.7	0.9	3.6

March 25, 1969

TABLE 2

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HIGHWAY ENGINEERING PROJECT

List of Roads and Bridges to be Engineered

A. Roads

Ref No.	Road	From	To	Length km
1	GP1	Tunis, pont de Carthage	Enfidaville	98
2	GP2	Enfidaville	PK 41	41
3	GP3	Tunis, pont de Carthage	PK 30	30
4	GP5	Tunis-Bardo	Medjez El Bab	56
5	GP6	Medjez El Bab	Beja	42
6	MC26, 41, 42 and 44	Junction GP1	Korba	46
7	MC27	Turki	Nabeul	29
				342

NOTE: Roads Nos. 1 to 5 are primary, and 6 to 7 secondary.

B. Bridges longer than 15 m

Ref. No.	Road	Kilometer point	River
1	GP3	193 + 910	El Foul
2	GP1	181 + 470	Kerker
3	GP17	150 + 570	Sarrath
4	GP7	114 + 450	Magsbaia
5	MC35	37 + 250	Zit
6	MC55	9 + 770	Tine
7	GP5	79 + 310	Siliana
8	GP17	2 + 640	Amor
9	GP17	3 + 690	Kebir

TABLE 2
(continued)

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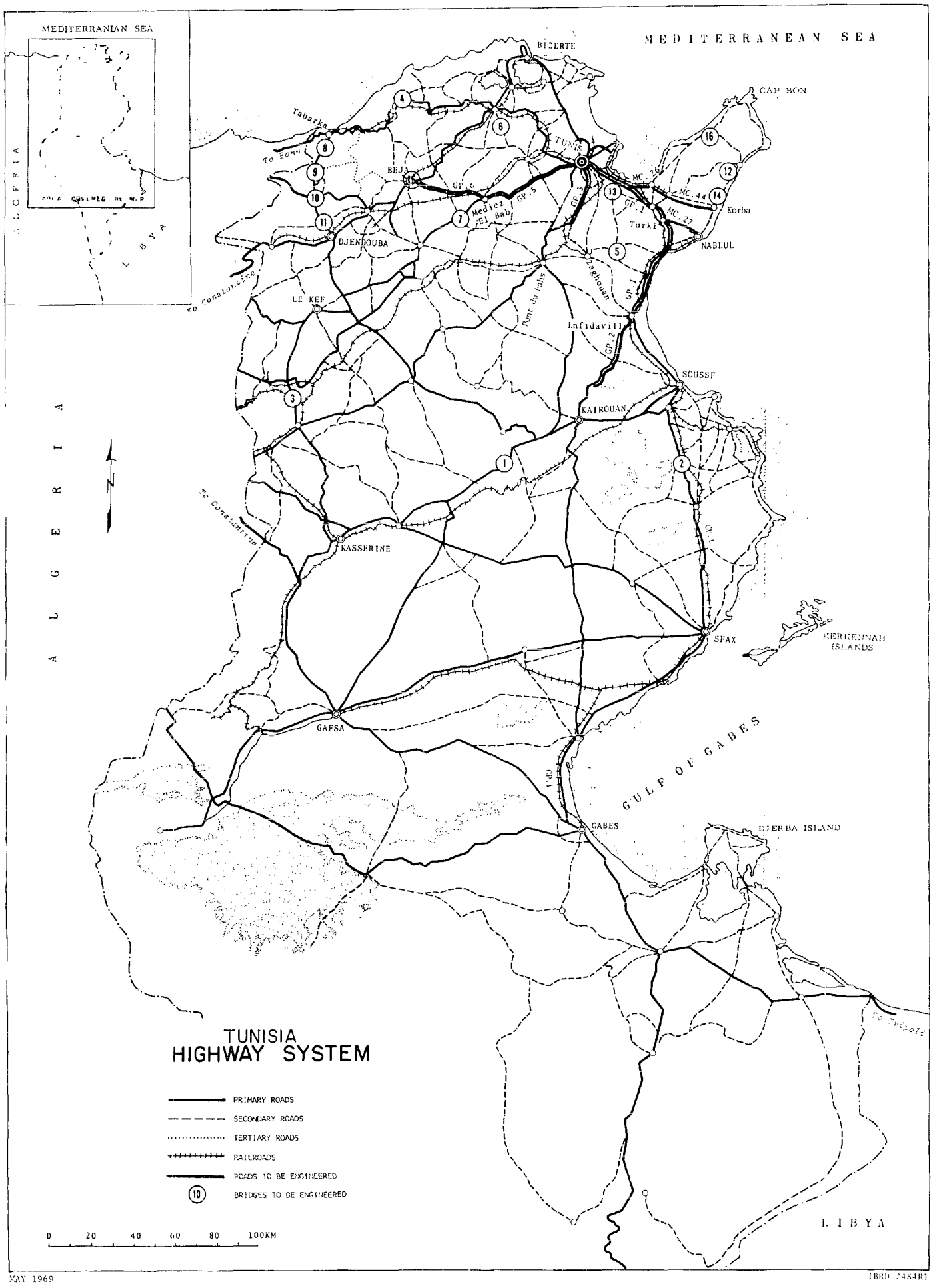
HIGHWAY ENGINEERING PROJECT

List of Roads and Bridges to be Engineered

Ref. No.	Road	Kilometer point	River
10	GP17	11 + 190	Renagha
11	GP17	33 + 410	Sardouk
12	MC27	54 + 440	Chiba
13	MC33 E	2 + 550	Miliane
14	MC27	28 + 230	Kebir
15	GP6	38 + 950	Bejà
16	MC26	39 + 980	Abid

May 12, 1969



MAY 1969

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