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TANZANIA

FIFTH HIGHWAY PROJECT

STAFF APPRAISAL REPORT

December 27, 1978

Highways Projects Division  
Eastern Africa Regional Office

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### CURRENCY EQUIVALENTS

Currency Unit	=	Tanzanian Shilling (T Sh)
US\$1.00	=	T Sh 8.00
T Sh 1	=	US\$0.125

### WEIGHTS AND MEASURES

1 meter (m)	3.28 feet (ft)
1 kilometer (km)	0.62 miles (mi)
1 square kilometer (sq km)	0.386 square miles (sq mi)
1 kilogram (kg)	2.2 pounds (lbs)

### GLOSSARY OF ABBREVIATIONS

CIDA	- Canadian International Development Agency
EAC	- East African Community
EDF	- European Development Fund
ICB	- International Competitive Bidding
MAJI	- Ministry of Water, Energy and Minerals
MCT	- Ministry of Communications and Transport
MFP	- Ministry of Finance and Planning
MOW	- Ministry of Works
NEDCO	- National Estates and Design Company
ODM	- Overseas Development Ministry (UK)
ORT	- Organization for Rehabilitation through Training
SIDA	- Swedish International Development Authority
TCSL	- Tanzania Coastal Shipping Line, Ltd.
USAID	- United States Agency for International Development
VOC	- vehicle operating costs
VPD	- vehicles per day
ZTRS	- Zambia-Tanzania Road Services

### GOVERNMENT OF TANZANIA

### FISCAL YEAR

July 1 - June 30

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## TANZANIA

### FIFTH HIGHWAY PROJECT

#### STAFF APPRAISAL REPORT

##### I. THE TRANSPORT SECTOR

###### A. Geographic and Economic Setting and its Effect on Transport

1.01 Tanzania, situated a few degrees south of the equator on the eastern coast of Africa (see map), has a land area of about 945,000 sq km, a large part of which is high, arid plateau. The population of about 15 million is concentrated near the three main Indian Ocean ports of Dar es Salaam, Tanga and Mtwara, and in the Lake Victoria region, the highlands around Kilimanjaro and the southern highlands near Lake Nyasa. Less than 10% of the population lives in towns, but the urban population is increasing much faster than the national average of 2.7% p.a.

1.02 Agriculture is the main economic activity, accounting for about 40% of the GNP and 80% of exports (mainly cotton, coffee, sisal, tobacco and cashewnuts). The small but growing industrial sector includes textile and sugar mills, tobacco processing, an oil refinery, and diverse other small plants. However, poor road conditions and lack of adequate transport seriously constrain the country's economic growth, especially the marketing of agricultural products and the delivery of agricultural inputs.

1.03 Tanzania's development philosophy aims at reducing inequalities in income distribution through rural development and through state control of large-scale agricultural enterprises and important industries and services, including those related to transport. To facilitate rural development and to improve overall efficiency, the Government in 1972 decentralized various administrative activities, giving the country's 20 administrative regions substantial power to control planning and budget provisions in their respective jurisdictions, particularly those activities concerned with development at the local level. With regard to roads, this decentralization policy is reflected in Government's decision to make all roads other than trunk roads the responsibility of regional administrations (para. 2.11).

###### B. The Transport System

###### The Network

1.04 Tanzania's transport system comprises roads (about 45,000 km), two railway systems (totalling 3,570 km of track), three main ocean ports and some minor ocean and lake ports, two international airports and over 50 smaller airfields. A pipeline carries oil between Dar es Salaam and Zambia; in addition, one of the railways, TAZARA, and a major road, the Tan-Zam

Highway, were built mainly to carry Zambian traffic. Since the collapse of the East African Community (EAC) in 1977, Tanzania has become wholly responsible for management of its transport system.

#### Highway Transport

1.05 Details of the highway subsector are discussed in Chapter II.

#### Railways

1.06 Two railway systems serve Tanzania: the Tanzanian Railway Corporation (TRC) and the Tanzania-Zambia Railway Authority (TAZARA). TRC was established as a corporate entity in 1977 to operate that part of the East African Railway Corporation (EARC) located within Tanzanian territory. Although not all issues involved in this transfer have yet been fully resolved, TRC now manages and operates the 2,600 km, 1.00 m gauge railway in northern Tanzania. Linking Dar es Salaam and Tanga with Arusha, Tabora, Mwanza, Kigoma, and Dodoma, the railway is particularly important for long-distance transport. TRC moves a wide variety of Tanzanian exports and imports, and its Dar es Salaam-Kigoma line handles transit traffic for its landlocked neighbors, particularly Burundi and Zaire. TRC's operations and services are not satisfactory because of low availability of locomotives and wagons and lack of workshop facilities as well as the deteriorated condition of equipment and track. Large investments are required, and the Canadian Government has agreed to provide substantial financial assistance.

1.07 TAZARA, financed by the Peoples Republic of China and owned jointly by Tanzania and Zambia, commenced operations in 1976 and consists of 1.067 m gauge track extending 970 km from Dar es Salaam to the Zambian border and continuing another 890 km into Zambia. The principal traffic at present is, and for some years will continue to be, Zambian exports of copper and Zambian imports. Future growth of Tanzanian traffic on the line will depend on development of the country's southern regions. Maintenance of locomotives, turn-around time of wagons and coordination with the port of Dar es Salaam are poor; Government is currently making efforts to improve this situation.

#### Ports and Shipping

1.08 The principal Indian Ocean ports of Dar es Salaam, Tanga and Mtwara are organized under the Tanzania Harbours Authority created in 1977 to take over operation of ports from the defunct East African Harbours Corporation. Dar es Salaam, with 11 alongside general cargo berths for ocean-going ships, handles nearly 4 million tons of traffic annually or about 85% of the total for the 3 ports. Tanga has no deep-water berths and requires use of lighterage facilities; Mtwara has two deep-water berths. Nearly half of the tonnage through the Dar es Salaam port is Zambian traffic. Recent planning studies of the Tanzanian ports have concluded that fairly sizeable investments for expansion of facilities and improvement of the entrance channel are needed for the Dar es Salaam port.

1.09 The Tanzania Coastal Shipping Line Ltd. (TCSL), established in 1971, is a parastatal corporation with a monopoly of carrying freight and

passengers between various coastal and island ports south of Dar es Salaam. Traffic between Dar es Salaam, Mtwara and Lindi is highly seasonal with heavy traffic in the rainy season when alternative road transport is unreliable, circuitous and costly. Until an improved coastal road including a costly bridge over the Rufiji River can be built (which appears unlikely for many years), the TCSL will play an important role in transport to and from south-eastern Tanzania.

1.10 Some transport services are also provided on Lake Victoria and Lake Tanganyika. The principal ports on Lake Victoria are Mwanza, Bukoba and Musoma. On Lake Tanganyika, Burundi-owned ships transport considerable cargo between Bujumbura and Kigoma, the western terminus of TRC.

#### Air Transport

1.11 Of the more than 50 officially designated airfields in Tanzania, only a few are built to standards high enough to permit operation of jet aircraft; of the remainder, many are dirt and grass strips used only occasionally. International airports are located in Dar es Salaam and Kilimanjaro; Mtwara, Tabora, Dodoma, Mwanza, and Zanzibar also have paved runways. The national air transport company, Air Tanzania, was established in 1977 following termination of operations of the East African Airways Corporation. Mainly using Fokker F-27 aircraft, the airline provides services to major centers within the country and limited services between Tanzania and certain neighboring countries. No regular air service is available from any carrier between Tanzania and Kenya; all road, rail and air traffic between the two countries was suspended in February 1977.

#### Pipeline

1.12 A pipeline financed by the Italian Government and operated by the Tan-Zam Oil Pipeline Company was completed in 1968 from Dar es Salaam to Ndola in Zambia. Initially, the 1,705 km line of 20.3 cm pipe principally carried gasoline to Zambia, but following construction of a refinery at Ndola, the line transports crude oil. Design capacity exceeds 700,000 tons p.a., and traffic flow has generally been at about that level.

### C. Transport Policy, Planning and Coordination

1.13 Before independence, the transport infrastructure was developed to serve Tanzania's external trade, but since the late 1960s, expansion of transport infrastructure has been directed towards providing neighboring landlocked Zambia with rail (TAZARA), pipeline and road access (the Tan-Zam Highway) to the Dar es Salaam port. More recently, Government's development policy (para. 1.03) has led to an increasing emphasis on rural road development, strengthening road maintenance capabilities and decentralization of the road administration.

1.14 In spite of the major investments undertaken in recent years in Tanzania to accommodate Zambia's import/export traffic, this traffic, for the following reasons, currently experiences considerable delays which seriously affect the Zambian economy: (a) Zambia's connection with the Atlantic Ocean - via the Benguela railway and the port of Lobito - has been closed since the outbreak of the Angolan Civil War, adding further pressure on the Tan-Zam corridor, but was reopened for limited traffic in October 1978; (b) the transport capacity of Zambia-Tanzania Road Services (ZTRS), a large trucking company operating between Zambia and Dar es Salaam, was deliberately reduced in anticipation of TAZARA's services; TAZARA, however, has not lived up to expectations and carries considerably less than planned; (c) partly as a result of TAZARA's inefficiencies, Dar es Salaam port is congested, and ships calling on Dar es Salaam experience waiting time of up to a month and sometimes more; and (d) operational coordination between ZTRS, TAZARA, and the port of Dar es Salaam is poor and adversely affects the utilization of available capacity of the Zambia/Dar es Salaam transport corridor. To improve Zambia's overall transport situation, the Zambian Government recently reopened its southern border to enable transport to pass through Rhodesia. In addition, the Consultative Group for Zambia is taking an active interest in the transport problem, and in July 1978 the Zambian Government requested Bank assistance in determining how best to mitigate the transport constraints in the Tan-Zam corridor. Furthermore, the Benguela railway may shortly become fully operational again; this would decrease the delays in the transport of goods to and from Zambia and considerably reduce the pressure on the Tanzanian transport links with Zambia.

1.15 Tanzania's transport situation has also been complicated by the dissolution of the EAC. Because of basic disagreements within the EAC, its railway, ports and air organizations have ceased operations and are in the process of being formally disbanded. New national organizations were established in 1977 to take over these responsibilities within Tanzania, and these now face serious problems, particularly the need for large capital investments from the national budget and the recruitment and training of additional skilled manpower.

#### Planning

1.16 The Ministry of Works (MOW) is responsible for planning highway investments while the Ministry of Communications and Transport (MCT) oversees planning for other transport modes. The Ministry of Finance and Planning (MFP) has the principal responsibility for financing transport investments and recurrent expenses. MFP prepares investment programs based on proposals from MOW, MCT, and the District Councils, after preliminary review by the Office of the Prime Minister. Transport planning capability is weak in all ministries, and data for planning are not systematically collected; hence little meaningful transport planning has taken place. Bank Group staff have been advising both MCT and MOW on preparation of a project-specific national transport plan which would define priorities and programs for investments in the sector. Thus far, neither Ministry has been able to commit significant resources to this exercise and MCT recently decided that a National Transport Study should be undertaken by consultants covering all modes of

transport. In October/November 1978 a three-man team, financed by the Swedish International Development Authority (SIDA), visited Tanzania to draw up terms of reference for the Study.

1.17 Government capital expenditures (in current prices) for development of transport and communications during 1970/71-1975/76 were as follows:

Fiscal Year	Roads and Bridges	Inland and Coastal Waterways			Total
		T Sh millions	Other	Total	
1970/71	163.1	19.7	42.0	224.8	
1971/72	128.5	23.4	180.4	332.3	
1972/73	73.3	16.1	204.1	293.5	
1973/74	119.4	2.6	24.7	146.7	
1974/75	174.4	7.1	34.9	216.4	
1975/76	219.2	3.4	14.9	237.5	

Source: Ministry of Finance and Planning and mission estimates, 1978.

Total development expenditures for transport and communications over the period declined as a proportion of Government's overall development expenditures.

1.18 Issuance of the 1976/77-1980/81 development plan was delayed until mid-1978 in order to make revisions necessitated by the 1974/75 economic crisis and, later, to gain Parliamentary approval of the plan. Government has, however, acknowledged that the transport plan may be further revised in view of the collapse of EAC transport organizations. A major emphasis of the transport plan as it now stands is development of the recently established transport organizations and their operation.

#### Coordination

1.19 Coordination of investments within the transport sector is almost nonexistent, largely because of the lack of planning capability and partly as a result of various difficulties faced by EAC transport organizations in the recent past. These problems have not led to serious misinvestments though there is a growing need to give this issue more attention; this matter should be addressed in the National Transport Study referred to in para. 1.16. Coordination of investments among transport and non-transport sectors has also been less than satisfactory as can be seen in southwestern Tanzania where the benefits to date realized by Tanzania from heavy transport investments in the Tan-Zam corridor appear minimal, indicating an urgent need for general development of the area in Tanzania served by corridor transport. Recently, however, Government has given higher priority to the development of this area, and certain projects being prepared should result in substantially increased benefits to Tanzania from the transport investments.

D. Previous Bank Group Projects in the Transport Sector

Previous Projects

1.20 A number of projects concerned with roads and road transport have been financed by the Bank Group: (a) US\$14 million, IDA Credit 48-TA in 1964 for construction of various road sections totalling 860 km; supplemented by a US\$3 million Credit in 1968 (115-TA); (b) US\$15.5 million under IDA Credit 142-TA and US\$7.0 million under Bank Loan 586-TA supplemented by a US\$7.5 million Swedish credit in 1969 for reconstruction of part of the Tan-Zam Highway; (c) US\$6.5 million, IDA Credit 265-TA in 1971 for construction of a main road in the southeast and betterment of selected feeder roads; (d) US\$10.2 million, IDA Credit 507-TA in 1974 for improving the maintenance of primary roads and for carrying out a study of the road transport industry; and (e) US\$15.0 million, IDA Credit 743-TA in 1977 for a trucking industry rehabilitation and improvement project, arising out of the road transport industry study under the previous credit. Rail and port improvements in Tanzania have been financed by the Bank Group through loans amounting to US\$166 million to the EAC organizations concerned; the loans assisted with improvement, modernization and expansion of the EAC railway and the ports of Dar es Salaam and Tanga.

Lessons

1.21 A Project Performance Audit Report on the revised First Highway Project (Report No. 791, June 26, 1975) found that implementation of the project's technical assistance and training programs aimed at improving Tanzania's highway administration was subject to unusual risks because of slowness and reluctance in recruiting expatriates, cultural and language problems experienced by the expatriates and an absolute shortage of local staff. Similar problems were experienced during the Second and Third Highway Projects. These problems as well as a severe shortage of housing for expatriates have also been handicapping implementation of the ongoing Fourth Highway Project (Credit 507-TA). As the proposed project depends heavily on the success of technical assistance and training, the experience gained from these earlier projects has been drawn upon, and the proposed project has been designed to make efficient use of the technical assistance provided.

II. THE HIGHWAY SUBSECTOR

A. The Network

2.01 The road network in Tanzania totals approximately 45,000 km, of which 7% are paved and 93% are gravel or earth as shown below:

	<u>Primary</u> Trunk Roads	<u>Secondary</u> Local Main Roads	<u>Tertiary</u> Regional and District Roads	<u>Total</u>
Bitumen	2,660	364	-	3,024
Gravel or Earth	<u>6,656</u>	<u>7,330</u>	<u>27,990</u>	<u>41,976</u>
	<u>9,316</u>	<u>7,694</u>	<u>27,990</u>	<u>45,000</u>

Source: Ministry of Works, 1978.

Only about 900 km of the gravel roads have been engineered while the remaining unengineered gravel or earth roads normally become impassable during the wet season. Roads classified as Trunk Roads (9,316 km) link the country's 20 regional capitals and connect Tanzania with neighboring countries; they vary in standard from two-lane paved roads to unimproved earth tracks. Roads classified as Local Main Roads (7,694 km) link other centers of economic activity with the trunk road network while those classified as Regional and District Roads (about 28,000 km) form the balance of the system. The 9,316 km trunk road system includes about 2,100 km of Local Main Roads and Regional Roads recently reclassified to Trunk Roads.

#### B. Traffic Growth and Characteristics

##### Traffic Counts

2.02 MCT is responsible for undertaking traffic counts. A good traffic counting system existed in the past, and fairly reliable and detailed traffic count information is available for the entire trunk road network up to 1974 and for specified stations since then. However, the system has deteriorated, and traffic counts are now undertaken only sporadically or on an ad hoc basis, primarily because of serious budgetary limits but also because of administrative constraints. Given the fundamental importance of traffic counts for transport planning, Government agreed to make regular and systematic traffic counts on its trunk road system (para. 5.01 (a)).

##### Traffic and Traffic Growth

2.03 Data on the growth of traffic are incomplete. However, traffic growth has been estimated at only 2 to 5% p.a. during the past 5 years, much below the annual rate of 7 to 8% which prevails in other East African countries. The relatively low estimated growth rate is based on scattered traffic counts and the probable effects of reduced agricultural production due to two years of drought, a rural population resettlement program, and restrictions on vehicle imports to conserve foreign exchange.

2.04 Of the 9,316 km of trunk roads, 29% are bitumen surfaced with relatively high traffic volumes, averaging 350 vehicles per day (VPD) but ranging as high as 1,400 VPD. Bitumen roads are mostly in fair condition and carry about 75% of the total annual traffic flow of 400 million vehicle-km on the trunk road system. The rest of the trunk road system consists of gravel or earth roads, mostly in poor condition. Traffic volumes on these roads average 55 VPD, while the most heavily trafficked 4% carry between 150 to just over 200 VPD.

2.05 As indicated in the following traffic composition table, bitumen roads carry higher percentages of passenger cars than do non-bitumen roads, whereas there are higher percentages of pickups, landrovers and trucks on gravel and earth roads.

<u>Trunk Roads</u>	<u>Cars</u>	<u>Pickups/ Landrovers</u>	<u>Trucks (9-ton)</u>	<u>Buses (50 pass.)</u>	<u>Total</u>
			<u>(%)</u>		
Bitumen	30	24	26	20	100
Gravel or earth	10	33	36	21	100
Average	<u>21</u>	<u>28</u>	<u>30</u>	<u>21</u>	<u>100</u>

Source: Ministry of Communications and Transport, 1978.

#### Trucking Industry

2.06 The private and parastatal truck fleet (excluding Government ministry vehicles) was estimated at about 13,000 vehicles in 1975, of which 10,000 were privately owned and 3,000 publicly owned. More recent, reliable, and detailed information should become available in 1979 as a result of a survey of the entire vehicle fleet being undertaken by MFP. In addition, under the Association's Trucking Industry Rehabilitation and Improvement Project (Cr. 743-TA), provision is made for the design and implementation of comprehensive and systematic data collection procedures for the transport industry, including all aspects of vehicle fleet size and composition.

2.07 The private sector mainly consists of owner-operators, but also includes transport cooperatives and traders or manufacturers with trucks for their own use. Private operators work on a competitive basis and concentrate on the more lucrative long-haul business, generally avoiding short distance operations and areas where business is less profitable and roads are poor.

2.08 Public sector trucking operations, accounting for one-third of total services, are provided by transport parastatals and transport wings of manufacturing, trading and crop parastatals. To permit a more effective use of existing trucking capacity, Government is reorganizing and improving public trucking and, with the assistance of the Association's ongoing Trucking Project, is setting up trucking companies in five important regions. Companies have been established and are already operating in three of these regions, and following decisions due shortly on capital structure, ownership and staffing, their operations will begin to benefit from financial assistance under the project.

Truck Weights, Inspections and Inspections

2.09 The 1973 Road Traffic Act adequately regulates truck weights, setting the maximum gross vehicle weight (including trailer) at 35,000 kg. More restrictive axle load limits apply to some roads because of limited pavement bearing capacity. Overloading was a major problem on the Tan-Zam Highway until December 1976 when Government began enforcing weight restrictions and obliging overloaded vehicles to offload. However, operators are now pressing MOW to relax the enforcement of regulations relating to gross vehicle weights on the Tan-Zam Highway, and the Ministry has proposed a study to assess the implications of such a move and the effect on the economic life of the road pavement. To help enforce vehicle weight regulations on other roads, the Government is installing weighbridges in about ten locations.

Trucking Rates

2.10 There is no national freight rate system in effect. Truck transport is relatively expensive, as high as US\$0.22 per ton-km for general cargo, because of poor road conditions and trucking inefficiencies, especially in the public sector. Rates charged by the private companies reflect costs and vary according to type of cargo, road condition and the possibility of return loads; the rates are revised frequently and are generally profitable and reasonable. In the public sector, rates are now often negotiated. Transport costs should be reduced in the future by operational improvements in the trucking industry under the ongoing IDA trucking industry project and by improved road conditions resulting from the ongoing Fourth Highway Project and the proposed project. These lower costs are expected to result in a gradual reduction in trucking rates.

C. Administration

2.11 In 1974, the former Ministry of Communications and Works (Comworks) was split into two Ministries, MCT and MOW, with the latter assuming responsibilities for roads and equipment. The present MOW organization is shown in Chart 1. Although MOW finances the construction and maintenance of trunk roads, regional authorities through their Regional Engineers, actually carry out field operations for road maintenance on the whole network, on trunk roads using funds and equipment provided by MOW and on the rest of the network using regional budget funds. In some cases agricultural authorities also undertake feeder road maintenance using their own resources.

2.12 These organizational arrangements present a number of problems, most of which arise from a shortage of trained and experienced staff, the lack of operational equipment and inadequate workshop facilities. Faced with extreme shortages of these resources and the heavy demands on the regional authorities in most sectors, Regional Engineers tend to respond to the orders given by their nearest supervisor, the Regional Development Director. When regional priorities conflict with MOW's requirements for trunk roads, the Regional

Engineer is sometimes pressed into diverting to regional works the resources provided by MOW for trunk road programs, including, although usually only temporarily, equipment financed under the Association's Fourth Highway Project (Cr. 507-TA). Although maintenance of trunk roads is progressively improving in areas covered under the project, it still occasionally suffers because of the diversion of resources. In some regions, MOW has taken on a technical supervisory role by directly posting its own Resident Engineers to oversee trunk road maintenance in cooperation with the Regional Engineer, and in these areas the tendency to divert resources has decreased significantly. This type of arrangement will be used in implementing the proposed project (para 3.23).

2.13 MOW has recognized that the organization of network responsibilities should be improved to ensure that the Ministry's priorities and programs are adhered to and that objectives of the proposed project are fulfilled. Various options for changing the present organization and management of trunk road maintenance have been explored. Government has agreed that by March 31, 1979 it would adopt a management system including operational guidelines which, consistent with the Government's overall decentralization policies, would enable MOW to determine and exercise full authority over trunk road maintenance programs and to control trunk road maintenance equipment. It was also agreed that Government, in consultation with the Association, would develop a program to implement the management system (para. 5.01 (b)).

#### D. Staff and Training

2.14 The shortage of qualified and experienced staff has long been a problem in all MOW divisions. In 1970, Comworks lost a considerable number of expatriates. Thereafter, despite some technical assistance from the Canadian International Development Agency (CIDA), generally less than one-third of the engineering and technical positions have been filled due to a lack of qualified nationals. With its wide-ranging responsibilities, including construction and maintenance of public buildings, repair and maintenance of vehicles and plant for several ministries, etc., MOW needs many trained and experienced staff. Short-term help has been obtained from the Indian Government, and in 1974 Tanzania engaged 35 Indian engineers to fill various MOW positions for 2 years, with some stays extended to 3 years. The effectiveness of this assistance in relieving MOW's staff constraint has been somewhat limited, however. First, the effective time of these engineers in the Ministry is significantly reduced owing to the need for familiarization as well as the inevitable winding down of performance towards the end of their contract. Second, MOW has not appointed local counterparts to the engineers for training. And third, even if MOW had appointed local counterparts, most of the Indian staff occupied demanding executive positions which allowed them little time for training of such staff.

2.15 A further 62 Indian engineers have been scheduled to join MOW in 1978 and 1979. Of these, 15 were allocated to fill some of the 73 vacant positions in MOW's Roads Division; by December 1978 only 5 of the 15 had arrived, and MOW is unsure as to when the others will arrive. Since the Indian engineers will work mainly in design, construction and materials sections where the need for fully qualified engineers is highest, many of the 58 positions in the Roads Division that will remain unfilled will be in the Maintenance Section. However, the majority of these vacancies require only qualified technicians who, with practical on-the-job training and experience, would be capable of supervising and managing MOW's maintenance and rehabilitation program. The Fourth Highway Project is helping to meet this need by providing technical experts to give lesser qualified staff on-the-job training in maintenance management, operations and procedures, and the proposed project would expand this effort. However, training under the Fourth Project has been constrained until recently by MOW's slowness in appointing local staff to vacancies in the Maintenance Section. This has been caused by the general shortage of technical staff in MOW as well as MOW's lack of organizational planning, which has resulted in less than optimal assignment and utilization of existing staff. The Ministry's present organization and allocation of staff should be reviewed in order to identify appropriate staff for re-assignment or appointment to various positions in MOW, including those filled recently for implementation of the Fourth Highway Project and those required for implementation of the proposed Fifth Highway Project. The proposed project provides for MOW to carry out such a review (para. 3.17).

2.16 If MOW's heavy dependence on expatriate engineers is to be reduced, a longer-term solution to the shortage of qualified staff is required. One alternative is suggested by the experience of the Ministry of Water, Energy and Minerals (MAJI) which, with financial assistance from SIDA and under an agreement with the Indian Government, sent 150 high school graduates to Roorkee University in India, to be trained as engineers. Reports from MAJI and the Indian Embassy in Tanzania indicate that the program is proving successful. The majority of these students will graduate in mid-1979 and return to Tanzania to take up engineering positions in MAJI. A similar program of engineer training for MOW is therefore included in the proposed project (para. 3.19).

2.17 For formal training of field crew personnel, in 1974 the Government constructed the Morogoro Training School with a capacity of 120 students. Five instructors as well as some training aids are being provided for the School under the Fourth Highway Project, and a modest but accelerating start has been made in training personnel required for the road maintenance program. From mid-1977 to June 1978, 58 road foremen, 59 plant operators and drivers, 19 auto-electrical and 32 foremen mechanics received training at the School and subsequently contributed to the improved maintenance performance noted in para. 2.32. However, the future need for trained personnel, as indicated in the following list, will be much greater.

Trained Personnel Required for Field Crews

Road Inspectors	6
Road Foremen	200
Plant Operators	220
Plant Attendants	31
Drivers	350
Mechanical (mechanics, welders, electricians)	240
Carpenters	9
 <u>Total</u>	 <u>1,056</u>

Source: Ministry of Works and ORT, 1978.

Training courses will be provided until 1980 under the Fourth Highway Project, by which time some personnel will have been trained. However, since the total requirement for trained staff will not be met by that time, it will be necessary to continue this effort at least until 1982, and the proposed project will provide for this need (para. 3.18). The recruitment and selection of trainees under the ongoing project has been below the School's capacity, mainly because of insufficient planning for trainee recruitment and the lack of direct involvement of MOW's maintenance section in the recruitment and selection of trainees for its program. These problems will be addressed under the proposed project (para. 3.18).

E. Planning

2.18 Highway planning in Tanzania is weak, and with few exceptions planning data are not systematically collected. An administrative reorganization in 1974 left MOW with no planning capability. In 1977, MOW created its own Planning Division, and has appointed a Director, a transport economist and another economist; in addition, a highway planner and a building industry planner have been assigned to the Division by SIDA. As the unit's operations expand, it will probably require additional staff and some technical assistance or consultants to assist with studies and analyses of important transport policy issues; the project provides financial assistance for this purpose (para. 3.15).

2.19 The Third Five-Year Plan (1976/77-1980/81) includes start of construction on the following links in the trunk road network. Completion of the program is not expected during the Plan period. The primary objective of this strategy, to pave important existing arteries connecting major centers of economic activity, is sound.

PLANNED TRUNK ROAD INVESTMENTS

<u>Road</u>	<u>Length (km)</u>	<u>Status</u>		
		<u>Feasibility Study</u>	<u>Detailed Engineering</u>	<u>Construction &amp; Financing</u>
Songea-Makumbako	325	completed	completed	under discussion with ODM
Dodoma-Morogoro	261	not done	completed	under discussion with various private and Government agencies
Makuyuni-Mwanza (a) Makuyuni-Oldeani	75	completed	not done	rehabilitation and maintenance included in Highways V; construction under discussion with Japanese Government
(b) Oldeani-Mwanza	415	completed	not done	no proposals
Songea-Mbamba Bay	180	not done	completed	no proposals
Chalinze-Stiegler's Gorge	190	not done	completed	commitment from NORAD as part of Stiegler's Dam Project
Stiegler's Gorge-Nyamwage	130	not done	not done	no proposals
Nyamwage-Lindi	300	completed	not done	under discussion with Japanese Government
Rusumo Falls-Isaka				
(a) Rusumo Falls-Lusahunga	93	not done	completed	started with aid from AfDB
(b) Lusahunga-Bukombe	127	not done	completed	no proposals
(c) Bukombe-Isaka	112	not done	completed	under discussion with EDF and DANIDA
Mwanza-Musoma				
(a) Mwanza-Bunda	120	completed	completed	started with aid from EDF
(b) Bunda-Musoma	64	completed	completed	started with aid from EDF

Source: Ministry of Finance and Planning, Third Five-Year Plan for Infrastructure and Social Services (July 1976-June 1981), 1978; Ministry of Works, 1978.

F. Expenditure and Finance

Expenditures on Trunk Roads

2.20 Through 1975/76 recurrent budget allocations and expenditures were inadequate to properly maintain the trunk road network, reflecting the Government's policy of giving priority to investments in agriculture and industry. Since then, however, Government has recognized the priority of reducing waste and loss of production caused by impassable and rough roads, and consequently, increased maintenance expenditures from about T Sh 35 million to over T Sh 100 million per year.

Expenditures on Trunk Roads and Bridges  
(T Sh million)

	<u>1973/74</u>	<u>1974/75</u>	<u>1975/76</u>	<u>1976/77</u>	<u>1977/78</u>
Recurrent	36.6	30.3	34.3	103.8	112.1
Development	94.6	143.7	170.8	145.4	123.0

Source: Ministry of Finance and Planning, 1978.

The 1977/78 allocation was significantly underspent. Two factors are responsible for this. First, the severe wet season in 1978 disrupted road works programs and prevented road maintenance gangs from working. Secondly, and more significantly for Bank Group projects, the country's capacity and capability for road maintenance is low due to shortages of equipment and trained, experienced manpower.

2.21 Both the ongoing Fourth Highway Project as well as the proposed project are directly aimed at increasing Government's capacity to maintain trunk roads and, indirectly, other roads. In support of this objective, Government agreed to progressively apply and continue to apply its increased road maintenance capability to the maintenance of its trunk road system in accordance with sound engineering practice and will promptly provide the funds required (para. 5.01(c)). In addition, the following points were confirmed during negotiations. Government confirmed that it will annually review with the Association the sufficiency of allocated road maintenance funds. For fiscal years 1980 through 1983, Government confirmed that a reasonable estimate of the funds required annually would be T Sh 106 million, T Sh 115 million, T Sh 118 million and T Sh 126 million, respectively, in January 1979 prices. Government has also confirmed that it will maintain an adequate level of expenditures, in real terms, for trunk road maintenance in the period following project implementation.

2.22 During the early 1970s, development expenditures for trunk roads mainly went toward construction of the Tan-Zam Highway which cost about T Sh 500 million and was finished in 1974. With the adoption of its decentralization policy in 1973, the Government's emphasis shifted to rural development, including feeder road construction, and for the first time the regions were allocated development funds directly. Since then only one rural trunk road and one urban road have been constructed: a two-lane bitumen road between Mtwara and Masasi in the south and a four-lane highway to reduce congestion in the industrial area between Dar es Salaam and its international airport. In 1978 construction started on two other rural trunk roads, one between Rusumo and Isaka, near Buhegela, as an international link to improve the access of landlocked Rwanda and Burundi to the Tanzanian ports, and the other road between Mwanza and Musoma around Lake Victoria. In addition, a start has been made on construction of an improved access road linking Dar es Salaam port with other major roads.

2.23 Since 1970, about two-thirds of total investments were financed with foreign financial assistance, predominantly in the form of credits and some grants. The main contributors have been the Bank Group, the United States Agency for International Development (USAID), the Federal Republic of Germany and the Scandinavian aid agencies.

Expenditures on Secondary and Tertiary Roads

2.24 Expenditures on secondary and tertiary roads are financed out of general revenue allocations from the central government. Apart from occasional externally-financed road development projects, for which MOW is given responsibility, all works on secondary and tertiary roads are the responsibility of the regional authorities. Expenditures on these roads are estimated as follows:

Expenditures on Secondary and Tertiary Roads  
(T Sh million)

	<u>1973/74</u>	<u>1974/75</u>	<u>1975/76</u>	<u>1976/77</u>	<u>1977/78</u>
Recurrent	53.4	70.8	57.7	53.9	82.6
Development	24.9	30.7	48.4	49.8	75.1

Source: Ministry of Finance and Planning, 1978.

The reduction in recurrent expenditures for the two years after 1974/75 resulted from a development policy favoring investments in agriculture and industry. Average expenditure on roads in those two years was less than US\$200 per km equivalent but was more recently increased to US\$300 per km equivalent. Though this should be sufficient to provide a reasonable level of maintenance on these low-traffic roads, regional authorities do not have the equipment, workshops or trained manpower necessary to carry out road maintenance work efficiently and economically. However, a certain amount of improvement has been achieved in some areas under projects financed by the Bank Group and bilateral aid. The Bank Group has financed a number of projects with feeder road components, including the Third Highways Project (Cr. 265-TA), agricultural projects for cotton (Cr. 454-TA) and tea (CR. 287-TA) as well as rural development projects in Kigoma (Cr. 508-TA) and Mwanza/Shinyanga (Cr. 803-TA). Norwegian aid has helped to finance feeder road betterment and maintenance units in two agricultural areas, and the British Overseas Development Ministry (ODM) is assisting feeder road development and maintenance in Tabora and is currently discussing with Government a proposed project to help several southern regions to improve their road maintenance capacity and performance. The results of these ongoing projects will be monitored during supervision of the proposed Fifth Highway Project. In addition, a Pilot Program is included under the proposed project to address regional road maintenance problems and to identify longer-term solutions to these problems (para. 3.13). Critical factors to be addressed are the limited absorptive capacity of regional authorities and the prospects for strengthening their road maintenance organization.

Revenues from Road Users

2.25 Local expenditures on roads are financed from general revenues to which road users contribute through taxes on vehicle ownership and use, as well as ferry charges (up to 1972/73). The greater part (about 85%) of total revenues from road users comes from import duty revenues. In 1976/77 and 1977/78 (the latter according to preliminary estimates), total revenues from road users were sufficient to cover almost all recurrent expenditures on all roads.

Annual Revenues

	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77
	(T Sh million)						
Vehicle Registration Tax )	19.4	7.3	7.9	9.9	1.7	0.4	0.6
)							
Vehicle Licenses )	25.3	23.2	28.6	5.5	6.1	5.8	4.8
)							
Tax on Vehicle Transfer )	2.3	1.8	5.7	5.7	7.7	6.0	6.1
Transport Licensing	3.4	3.1	4.7	5.1	11.5	10.3	8.5
Ferry Receipts /1	1.6	1.8	-	-	-	-	-
Import Duties on Fuel, Tires, Tubes, and Vehicles	112.8	106.2.	118.7	149.4	154.1	145.9	166.1
<b>TOTAL</b>	<b><u>164.8</u></b>	<b><u>143.4.</u></b>	<b><u>165.6</u></b>	<b><u>175.6</u></b>	<b><u>181.1</u></b>	<b><u>168.4</u></b>	<b><u>186.1</u></b>

/1 Ferry receipts ceased in 1973.

Source: Ministry of Finance and Planning, 1978 and IDA Estimates.

G. Engineering

2.26 Minor roads and bridges are designed by MOW staff, but all economic and engineering feasibility studies and detailed engineering for major projects are undertaken by consultants. Most consulting work is carried out by private, generally expatriate, firms although the National Estates and Design Company (NEDCO), an MOW parastatal organization established in 1971 to do planning and design work on a commercial consultative basis, undertakes a small but growing proportion of this work. NEDCO has the right of first refusal to all Government and parastatal design and planning work. Although principally involved in architectural work, NEDCO does undertake some industrial and urban development projects. Its work in these areas is generally

satisfactory and improving as it gains experience. However, like all other engineering enterprises in Tanzania, it suffers from lack of staff. A recent study of the construction industry (para. 2.29) included a review of NEDCO's capacity, performance and staffing, and the Government is currently considering ways in which NEDCO can be strengthened.

#### H. Construction

2.27 Major road construction works are undertaken by contractors after competitive bidding. MOW undertakes small construction works by force account and is developing its capability in this area through betterment and maintenance units which are managed by local MOW staff or by consultants until local staff can take over. Although supervision of construction is normally done by consultants, MOW has recently used its own staff for supervision of one or two such projects, with generally satisfactory results due in part to training its staff received from consultants supervising other projects. However, because of MOW's serious lack of qualified engineers, it is expected that most construction supervision will continue to be done by consultants for some time to come.

2.28 The Mwanachi Engineering and Construction Company (MECCO), an MOW commercial construction parastatal formed in 1971, mainly undertakes building construction and urban infrastructure projects, such as urban roads or sites and services projects. In its first two years of operation, MECCO's performance was not commercially successful, and it was on the verge of bankruptcy due to shortages of working capital, lack of qualified staff, lack of machinery and equipment and a Government requirement that it accept contracts at unrealistically low prices. Its operations have improved recently as a result of considerable assistance in the form of equipment and technical assistance from the Finnish Government.

2.29 Only a few small local construction firms are active in Tanzania; they are not equipped for roadworks but concentrate instead on building construction. MOW, with assistance from SIDA, carried out a study of the local construction industry in 1977 and is currently considering the study's recommendations on improving and strengthening the industry. SIDA has assigned a construction industry planner to the MOW Planning Division, who will assist MOW to develop policies and programs for the industry.

#### I. Maintenance

##### Trunk Roads

2.30 Although well maintained in the early 1960s, trunk roads are now mostly in poor condition and frequently impassable during the rainy season. MOW has been unable to adequately maintain these roads because of the unsatisfactory organization of maintenance operations already described (para. 2.12) and more importantly, because of inadequate budgetary allocations (para. 2.20).

and a shortage of trained and experienced staff (para. 2.14). The lack of money for equipment and tools coupled with a need for qualified road maintenance supervisors has sharply decreased the effectiveness of labor gangs. Equipment operations suffered particularly from a shortage of foreign exchange which prevented the importation of new equipment and caused equipment availability and utilization to decline because of a lack of fuel and lubricants, spare parts, workshops and workshop equipment and tools. In addition, the insufficient number of trained and experienced equipment operators and their supervisors led to a higher than normal amount of damage and breakdowns.

2.31 Government is attempting to improve this situation through more balanced road expenditure programs which give increased emphasis to road rehabilitation and maintenance. From the point of view of cost effectiveness, this strategy is sound and should receive continued support. In Tanzania, rehabilitation of roads to all-weather standard costs between about US\$3,500 and US\$12,500 per km, whereas bituminized roads cost between US\$200,000 and US\$250,000 per km. 1/ With traffic volumes on trunk roads averaging 55 VPD and over 85% of these roads carrying less than 100 VPD, rehabilitation to all-weather unengineered standard with improved maintenance yields more than 75% of the vehicle operating cost savings of full construction and bituminization. In addition, such a program yields these benefits to users more quickly and at considerably less investment cost.

2.32 With the Fourth Highway Project, the Association is supporting Government's strategy for roads by providing financial assistance to help maintain trunk roads in Tanzania's ten southern and eastern regions, and maintenance of these arteries has recently improved significantly in both quality and quantity. Although initial implementation of that project was slow, progress has improved since early 1977 when technical assistance and project-financed equipment began to arrive in the country. Up to March 1978 the following work was carried out under the project: reconstruction - 7 km, earthworks - 26 km, grading - 302 km, graveling - 448 km, patching of asphalt roads - 44 km, and resealing of asphalt roads - 8 km. Continued improvement in the longer term will hinge on the appointment and training of local staff to carry on the work after the expatriate technical staff leave. Accordingly, to fully achieve the objectives of the Fourth Highway Project, it is essential that MOW staff assigned for each of the positions for which technical experts are being provided under that project should be appropriately qualified and adequately trained to plan, supervise and implement effective and efficient maintenance programs. By the same token, the extension of technical assistance for the maintenance of primary roads in the country's northern and western regions as intended under the proposed project will also require the training of a sufficient number of suitable local staff. The proposed project is designed to alleviate the local staffing problem (para. 3.17) as well as to provide equipment, materials, road camps and improved workshop facilities (paras. 3.08-3.12).

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1/ Cost based on past projects and recent feasibility and engineering studies.

2.33 Improved maintenance of trunk roads has been achieved with the guidance and supervision of technical experts financed under the ongoing project. However, recruitment and retention of these experts has been below scheduled levels, partly because of an extreme shortage of housing, particularly in Dar es Salaam. As a result only 16 of the 21 project advisor positions have been filled at any one time, and project implementation has suffered accordingly. Since this situation has proven to be intractable, the proposed project includes financing for housing of the necessary expatriate experts (para. 3.17).

2.34 The efficiency and management of road maintenance operations is also seriously hampered by the country's poor communication systems. Telephone services are not always available throughout the country or, where they exist, are erratic and slow. Travel conditions on roads are likewise slow and unreliable, resulting in long delays in the ordering and transport of men, machinery and materials. Accordingly the proposed project includes finance for a two-way radio communication system between headquarters, base camps and key supervisory and mechanical personnel (para. 3.08).

2.35 Road rehabilitation and maintenance work in Tanzania is carried out largely by regional road units using some equipment to supplement labor gangs. Since most of the equipment is old and frequently obsolete or inoperable, much of the minor works are necessarily carried out by labor-intensive methods. However, a major constraint to the increase of such work methods is the severe shortage of trained, experienced supervisory staff. Efforts are proceeding under road components of the Tabora and Mwanza/Shinyanga Rural Development Projects (Crs. 703/803-TA) to establish appropriate organizations, management and operating procedures for expansion of labor-intensive and self-help methods of maintaining rural feeder and village access roads. The lower standards and levels of traffic involved make these roads, rather than trunk roads, more appropriate for experiments in labor-intensive work methods. If such methods prove satisfactory, they could be incorporated into future projects for roads of higher classification. Since the trunk road system is now in such poor condition and in need of urgent rehabilitation and maintenance, the proposed project is designed for the most efficient use of the relatively few capable road supervisory staff available, with an appropriate mix of equipment and labor.

#### Secondary and Tertiary Roads

2.36 Regional authorities are responsible for the development and maintenance of secondary and tertiary roads, nearly 80% of the total road system. Each of the 20 regions has a Works Division for civil works including construction and maintenance of rural roads as well as the maintenance of trunk roads on behalf of MOW. Lacking the necessary road-works skills and resources, the regions have been able to do only sporadic work and usually only on an emergency basis following damage caused by heavy rains and flooding. As a result secondary and tertiary roads are in such poor condition that in some cases crop and marketing parastatals are forced to allocate their own funds to carry out emergency works on roads serving their production areas. The principal constraints facing the regions are lack of finance,

equipment, workshops and workshop tools, and trained staff. Although under the Fourth Highway Project MOW agreed to rehabilitate its existing equipment for use by regional authorities on secondary and tertiary roads, little progress has been made due to lack of foreign exchange for spare parts, lack of workshops, and a shortage of trained workshop staff. In addition, management is poor and record keeping is almost nonexistent. A pilot program is included in the proposed project to assist in determining how maintenance planning and operations undertaken by the regions on rural roads can be improved (para. 3.13). Eventually, this should eliminate the need for independent units financed under agricultural projects (para. 2.24).

### III. THE PROJECT

#### A. Background

3.01 In 1971 the Government commissioned a highway maintenance and organization study (USAID-financed), which made recommendations on the equipment, staffing and organization needed to restore maintenance of the road network to an adequate level. On the basis of these recommendations, MOW decided to undertake an extensive maintenance effort concentrating initially on trunk roads which carry the highest traffic volumes and on building up an appropriate national network maintenance organization. It was decided to implement this program in stages, the first of which was financed under the Fourth Highway Project (Credit 507-TA) and concentrated on the trunk roads in the southern and eastern half of the country. The Government has now decided to proceed with another stage to cover trunk roads in the northern and western half of the country.

3.02 The proposed new project is based on progress, results, experiences and lessons learned under the Fourth Highway Project and on a preparation study undertaken by consultants, World ORT (Switzerland), and financed under that project during the first half of 1978.

#### B. Objectives

3.03 In line with Government's goal to improve MOW's capability and capacity to maintain and rehabilitate the trunk road network, the project's two main objectives are:

- (a) to improve the condition of the trunk road network in the northern and western areas of the country in order to reduce transport costs and to promote economic development; and

- (b) to increase the long-run road maintenance capability of the MOW through on-the-job and formal training of local road maintenance personnel at all levels.

C. Project Description

Highway Maintenance Program

3.04 The project includes financing of a highway maintenance program to help improve routine and periodic maintenance (regravelling and rehabilitation) of trunk roads in the northern and western regions of the country (5,109 km). A summary of the lengths and surface types of all trunk roads in each region in the project area is given below, and a detailed inventory is presented in Annex 1.

	<u>Bitumen</u>	<u>Gravel and Earth</u>	<u>Total</u>
	km		
Arusha	256	391	647
Dodoma	21	538	559
Kigoma	6	377	383
Kilimanjaro	228	60	288
Mara	-	175	175
Mwanza	58	309	367
Rukwa	-	497	497
Shinyanga	3	288	291
Singida	9	524	533
Tabora	4	705	709
West Lake	22	638	660
<b>Total</b>	<b>607</b>	<b>4,502</b>	<b>5,109</b>

Gravel and earth roads have been combined in one category ("gravel and earth") as the distinction between them in the project area is often nebulous: (a) the gravel surface of many "gravel" roads is frequently nonexistent because of the backlog of maintenance; and (b) the geometrical design standards of the two road types are the same in most cases since few of the gravel roads are engineered.

3.05 It is not practicable to improve routine and periodic maintenance simultaneously on all these roads due to a backlog of work and the limited funds and manpower available. Accordingly, the project will include the highest priority roads, selected on the basis of transport cost savings, and will cover rehabilitation and regravelling on the gravel or earth roads listed on page 23. These roads, listed in priority order, have been identified by MOW and IDA staff as being in urgent need of routine and periodic maintenance.

The first year's program will be as shown in the schedule on page 23, and for subsequent years MOW's Maintenance Management Engineer and his supporting staff, with the assistance of expatriate technical advisors included in the project, will annually review the maintenance requirements of trunk roads in the project areas and if necessary revise the schedule of roads to be rehabilitated and regravelled under the project. In this way, the schedule can take into account any changes in road conditions brought on by weather or traffic as well as changes in development and transport priorities. The schedule of roads to be rehabilitated and regravelled under the project will form part of a detailed project implementation program. Government has agreed to submit for review a detailed annual project implementation program to the Association by April 30 of each year during project implementation, starting in 1979 (para. 5.01(d)). This program would include exact locations, design and construction details, cost estimates, proposed budgetary allocations and actions to be taken in connection with the program for implementing the management system referred to in para. 2.13. As roads are rehabilitated and regravelled, routine maintenance crews will be established under the project to continue adequate maintenance. The project will also provide for the establishment of routine maintenance crews to eventually maintain the approximately 600 km of bitumen roads in the project area.

3.06 Routine maintenance, regravelling and rehabilitation will be carried out by the crews to be established and equipped under the project in the numbers shown below:

	1979/ 1980	1980/ 1981	1981/ 1982	1982/ 1983	1983/ 1984	1984/ 1985	1985/ 1986
<b>Gravel/Earth Roads</b>							
Regravelling units (No.)	1	2	2	2	2	2	1
Length regravelled (km)	50	100	100	100	100	100	50
<b>Rehabilitation units (No.)</b>							
Length rehabilitated (km)	160	320	320	320	160	80	80
<b>Cumulative length regravelled and rehabilitated (km)</b>							
	210	630	1050	1470	1730	1910	2040
Routine Maintenance Units (No.)	4	8	16	16	22	25	26
<b>Bitumen Roads</b>							
Routine Maintenance Units (No.)	2	4	6	6	6	6	6
Cumulative length maintained (km)	200	400	600	600	600	600	600

REHABILITATION AND REGRAVELLING PROGRAM 1979/80-1985/86<sup>1/</sup>

<u>Fiscal Year</u>	<u>Road Section</u>	<u>Length per Section</u>	<u>Total Length per Year</u>	<u>Traffic VPD</u>	<u>VOC<sup>2/</sup> Savings/km (T Sh'000)</u>
		km			
<b>A. Roads to be Rehabilitated</b>					
1979/80	AR-7 (i) SH-2 (ii)	70 90		160 121	80.8 62.2
			160		
1980/81	SH-2 (ii) DO-3 (ii) AR-7 (ii) WL-1 (ii) MW-2	13 136 21 44 106		121 112 62 115 90	62.2 58.0 25.6 53.0 50.2
			320		
1981/82	DO-2 (ii) SI-3 (ii) SI-1 (ii)	140 56 124		94 95 78	49.7 45.9 44.3
			320		
1982/83	SI-1 (ii) TA-3 DO-4 (ii) SI-2 (ii) AR-6	39 31 52 115 83		78 85 73 73 68	44.3 43.9 41.5 39.5 36.3
			320		
1983/84	AR-6 TA-4 (ii) MW-1	46 111 3		68 73 66	36.3 35.9 31.5
			160		
1984/85	MW-1 TA-2	27 53		66 47	31.5 23.8
			80		
1985/86	TA-2 WL-2 RU-1	4 31 45		47 39 29	23.8 19.3 12.1
			80		
	<b>Grand Total</b>		<b>1,440</b>		
<b>B. Roads to be Regravelled</b>					
1979/80	WL-3 (ii) AR-3 (ii)	42 8		203 118	92.7 64.6
			50		
1980/81	AR-3 (ii) MA-2	52 48		118 72	64.6 37.5
			100		
1981/82	MA-2	100		72	37.5
			100		
1982/83	MA-2 DO-1 (ii)	6 94		72 46	37.5 26.7
			100		
1983/84	DO-1 (ii)	100		46	26.7
			100		
1984/85	DO-1 (ii) WL-4	16 84		46 39	26.7 22.2
			100		
1985/86	WL-4 AR-4	31 19		39 33	22.2 17.4
			50		
	<b>Grand Total</b>		<b>600</b>		

1/ See Annex 1 for identification of, and details on, individual road sections.

2/ Total annual vehicle operating cost savings per km, in 1977, if roads had been in good condition.

Production rates are estimated as follows: for each regravelling unit, approximately 50 km per year; and for each rehabilitation unit, about 80 km per year. These rates are based on recent experience under the Fourth Highway Project, the performance of betterment and maintenance units in several rural areas and discussions between MOW and Association staff. They are realistic estimates and include some provision for variation and slippage. As roads are regravelled or rehabilitated, the project provides for progressive reduction in the number of rehabilitation and regravelling units and their reform into routine maintenance units for the improved roads. In addition to the 16 routine maintenance units to be established by 1981/82, 10 more units will ultimately be formed following conversion of two rehabilitation units in 1983/84, one in 1984/85 and a regravelling unit in 1985/86. The production rate for routine maintenance of bitumen roads is estimated at about 100 km per unit. As the highest priority gravel and earth roads are rehabilitated or regravelled, they will be taken over for maintenance by the routine maintenance crews established under the project, and it is expected that each of these units will maintain about 80 km of rehabilitated or regravelled roads. As these maintenance units are established and equipped and their personnel gain training and experience, they may be able to extend their operations so that they can maintain some of the remaining lower priority sections of the trunk road system which do not need rehabilitation or regravelling immediately. Just what length of road these units will be able to maintain efficiently is not known as no data exist on actual production rates for adequate maintenance work on such roads. Accordingly, provision is made under the proposed project to develop detailed performance and output reporting procedures which will be monitored during project supervision to determine optimum locations for base and road camps and road lengths to be maintained by each unit (para. 3.23).

3.07 To carry out the program, the project includes:

- procurement of road maintenance and rehabilitation equipment including an initial stock of spare parts (paras. 3.08-3.09);
- procurement of zonal workshop equipment and tools (para. 3.10);
- construction of base and road camps for the various project crews (para. 3.11);
- procurement of an initial stock of road maintenance materials such as bitumen and culverts (para. 3.12);
- a pilot program for regional roads maintenance (para. 3.13); and
- technical assistance and training (paras. 3.14-3.19).

#### Road Maintenance and Rehabilitation Equipment

3.08 Trunk road maintenance in the northern and western areas of the country suffers from insufficient equipment and vehicles and poor facilities to repair, maintain and service these items. The existing equipment held by the regions is used for the maintenance of all roads within the region and at times is also required in other regional work for schools, hospitals, crop movement, etc. The project provides for the procurement of road maintenance equipment, vehicles, mobile workshops and workshop equipment, mechanics' tool sets and a two-way radio communication system to be used exclusively on trunk road maintenance and rehabilitation (para. 2.13). Annex 2 gives a list of the type, numbers and cost of equipment to be purchased. The project also provides an initial stock of spare parts for new equipment.

3.09 The list of equipment to be purchased was defined by ORT and MOW with the assistance of Association staff on the basis of an assessment made under the Fourth Highway Project of total equipment needs and manning schedules for various types of road units (Annex 3).

#### Zonal Workshop Equipment

3.10 MOW, which has inadequate and poorly-equipped workshops, is embarking on a program of building and equipping a number of zonal workshops throughout the country, financed largely from its own resources. Since MOW is responsible for servicing, repair and overhaul of most of the country's heavy equipment, including that for other ministries, the workshops will not be dealing exclusively with road maintenance equipment. To help these workshops handle the particular requirements of road maintenance equipment, the proposed project provides a notional amount for the purchase of specialized tools and equipment. Specific items to be financed will be decided when the number and type of shops are determined. Agreement was reached that technical specifications and lists of equipment to be purchased for the zonal workshops shall be submitted to the Association for its review and approval (para. 5.01(e)).

#### Construction of Base and Road Camps

3.11 The creation of new maintenance, regravelling and rehabilitation units for trunk roads will create a need for camps and depots from which the units will operate, and the project provides financial assistance for this. The exact locations, designs and construction details will form part of the detailed project implementation program (para. 3.05) to be submitted for the Association's review by April 30 of each year during project implementation, starting in 1979 (para. 5.01(d)).

#### Road Maintenance Materials

3.12 Road maintenance in Tanzania has been suffering from the lack of sufficient and appropriate materials; the project will accordingly provide financial assistance for purchasing an initial stock of the following essential requirements: 2,500 tons of bitumen; 250 tons of steel reinforcement; 100 tons of steel plate; 2,500 m of steel culverts; and 5 tons of explosives and detonators.

Pilot Program for Regional Road Maintenance

3.13 Maintenance of regional roads is poor because regional authorities lack the skills and resources to adequately maintain the roads under their jurisdiction (para. 2.36). Government therefore wishes to undertake a pilot program in the regions of Mwanza and Zanzibar to determine how regional road maintenance management and operations might be improved. The project will assist the pilot program by financing the purchase of spare parts and the rehabilitation of existing equipment. Experts provided to MOW under the project (para. 3.15) will also advise the pilot regions in technical matters and assist them to improve planning and management of rural road maintenance and to determine a satisfactory level of recurrent cost funding to continue adequate maintenance. These experts will also assist the regions to assess and, where feasible, introduce more appropriate technologies, including better mixes of labor and capital, for their road maintenance operations. Training of regional equipment operators, workshop personnel and key road maintenance staff will be given at the Morogoro Training School. Government has agreed that by December 31, 1979 it will submit to the Association, for its review and approval, a detailed implementation program for the Pilot Regional Program, including a list of spare parts for repair and rehabilitation of existing regional equipment and a plan for deploying technical assistance (para. 5.01(f)).

Technical Assistance and Training

3.14 Road maintenance suffers because of the serious lack of trained personnel at all levels of MOW's maintenance organization (paras. 2.14-2.17); the project therefore provides financing for technical assistance and training as follows:

- (a) 18 technical experts for a total of 498 man-months to provide on-the-job training and advice to MOW staff and field personnel;
- (b) 4 instructors for a total of 90 man-months and teaching aids for MOW's Morogoro Training School for training of plant and vehicle mechanics, operators and drivers as well as road foremen and supervisors; and
- (d) the training of about 120 engineers.

3.15 Altogether, 612 man-months of technical assistance are included in the project for a three-year period (1979-1981) as summarized below:

<u>Program</u>	<u>No.</u>	<u>Man-months</u>
<u>Road Maintenance Program</u>		
Advisors to:		
Maintenance Management Engineer	1	36
Maintenance Administrator	1	36
Plant and Procurement Engineer	1	36
Mechanical Supervisor	1	30
Bridge and Culvert Superintendent	1	24
Trunk Road Maintenance Superintendent	5	132
Equipment Service Manager	5	126
Roadworks Superintendent	3	78
Subtotal	<u>18</u>	<u>498</u>
<u>Morogoro Training School</u>		
Advisors to:		
Training Coordinator	1	24
Mechanics Instructor	1	24
Roadworks Instructor	1	18
Electrical Systems Instructor	1	24
Subtotal	<u>4</u>	<u>90</u>
TOTAL	<u>22</u>	<u>588</u>

In addition, financial assistance is included for the equivalent of a further 24 man-months of technical assistance or consultants' services for planning.

Road Maintenance Program

3.16 In order not to delay the project, it will be a condition of Credit effectiveness that advisors to the Maintenance Management Engineer, the Maintenance Administrator and the Plant and Procurement Engineer have been recruited and are in post to plan and initiate project implementation details, to prepare specifications and bid documents for equipment procurement, and if practicable to initiate the international competitive bidding process (para. 5.02). Retroactive financing of expenditure for these early recruits may be required and is proposed (para. 3.27(f)).

3.17 Technical experts will be provided to assist, train and counsel MOW staff and provide on-the-job training for the crews and units within their purview. Terms of reference for technical assistance to MOW under the project have been drafted based on experiences under the Fourth Highway Project and are included in the Project File (see Annex 5, No. C-3). The terms of reference were discussed with Government which agreed that suitably qualified experts will be employed under terms and conditions satisfactory to the Association (para. 5.01(g)). Due to the severe shortage of appropriate housing in Tanzania (para. 2.33), the project helps to finance 16 houses for the technical experts engaged. In view of the problems under the Fourth Highway Project in assigning and appointing local staff to fill vacancies in MOW's Maintenance Section, it will be a condition of Credit effectiveness that

MOW executive staff, having qualifications and experience satisfactory to the Association, have been appointed and are in post for the positions of Maintenance Management Engineer, Maintenance Administrator, Plant and Procurement Engineer, Mechanical Supervisor, one Trunk Road Maintenance Superintendent and one Roadworks Superintendent (para. 5.03). In addition, Government agreed to appoint all local staff, having qualifications and experience satisfactory to the Association, to each position in MOW's Road Maintenance Section for which advisors are to be provided, prior to the date when such advisors are employed but in any event not later than December 31, 1979 (para. 5.01(h)). It was further agreed that Government will review MOW's staffing in order to improve manpower allocation and utilization within the Ministry and by March 31, 1979 furnish the results and recommendations of that review to the Association for comment (para 5.01(i)).

Morogoro Training School

3.18 On-the-job training provided by the maintenance experts will be supplemented by formal training courses given at MOW's Morogoro Training School, for which instructors and training aids were financed under the ongoing project. Provision is included in the proposed project for additional training aids and the continuation, for a further two years, of advisors to the training coordinator, mechanics instructor and roadworks instructor as well as the addition of an advisor to the instructor for plant and automotive electrical systems. Terms of reference for technical assistance provided to the Training School will be similar to those used under the Fourth Highway Project, and agreement was obtained from Government that suitably qualified experts will be employed under terms and conditions satisfactory to the Association (para. 5.01(g)). In view of the problems in recruiting trainees for the School, it will be a condition of Credit disbursement for all technical assistance to the Morogoro Training School that a two-year program, satisfactory to the Association, will have been prepared for the recruitment and training of trainees to attend the School (para. 5.04).

Training of Engineers

3.19 Since the exodus of expatriate engineers in the early 1970s, MOW has been seriously short of qualified and experienced engineers. In view of the low number of engineers graduating from Dar es Salaam University, the low proportion of these allocated to MOW and the normal attrition of MOW's present staff, the Ministry will have trouble maintaining even its present low engineering strength. A major effort is required to boost the number of engineers in MOW; thus the project provides for the training of about 120 engineers in four-year engineering courses at the Roorkee University in India or an equivalent institution. High school graduates will be recruited or, when they are already employed by MOW, reassigned to study from July 1979 onwards. No problem in securing a sufficient number of candidates is expected since the program will be phased over several years. MOW will subsequently gain about 120 qualified engineers who, when experienced, will satisfy most of MOW's backlog of needs for qualified staff and significantly help to reduce its dependence on expatriates. Agreement was obtained from Government that by

June 1, 1979 it would make arrangements satisfactory to the Association for the training for MOW of about 120 high school graduates in an engineering program at appropriate institutions of higher education (para. 5.01(j)).

D. Cost Estimates

3.20 Total project capital costs, including contingencies, are estimated at US\$25.71 million. The foreign exchange component is estimated at US\$20.65 million or 80% of the total cost. The project will be exempt from taxation. A breakdown of capital costs (in January 1979 prices) plus contingencies is shown below and the estimated annual expenditures, both capital and recurrent, follow.

<u>Item</u>	<u>Local</u> ---(T Sh million)---	<u>Foreign</u>	<u>Total</u>	<u>Local</u> ---(US\$ million)---	<u>Foreign</u>	<u>Total</u>	<u>Foreign</u> <u>Exchange</u> <u>%</u>
(a) Road Maintenance and Rehabilitation Equipment, including spare parts	6.96	89.07	96.03	0.87	11.13	12.00	93%
(b) Zonal Workshop Equipment	0.28	4.67	4.95	0.04	0.58	0.62	94%
(c) Construction of Base and Road Camps	16.24	2.86	19.10	2.03	0.36	2.39	15%
(d) Road Maintenance Materials	3.14	4.92	8.06	0.39	0.62	1.01	61%
(e) Rehabilitation of Existing Regional Equipment -Pilot Program	0.20	3.32	3.52	0.02	0.42	0.44	95%
(f) Technical Assistance and Training							
(i) Technical assistance for planning and road maintenance	0.97	19.39	20.36	0.12	2.43	2.55	95%
(ii) Instructors for Morogoro Training School	0.17	3.36	3.53	0.02	0.42	0.44	95%
(iii) Training aids	0.05	0.75	0.80	0.01	0.09	0.10	90%
(iv) Provision of housing for technical experts	2.40	1.60	4.00	0.30	0.20	0.50	40%
(v) Training of engineers	0.49	9.96	10.45	0.06	1.25	1.31	95%
Sub-total	<u>30.90</u>	<u>139.90</u>	<u>170.80</u>	<u>3.86</u>	<u>17.50</u>	<u>21.36</u>	82%
(g) Contingencies							
(i) Physical 10% on Items (c) to (f)	2.38	4.92	7.30	0.30	0.61	0.91	
(ii) Price:							
- Items (a) and (b) - see para. 3.21(d)	1.41	10.33	11.74	0.18	1.29	1.47	
- Items (c) to (f) - see para. 3.21(d)	<u>5.75</u>	<u>9.97</u>	<u>15.72</u>	<u>0.72</u>	<u>1.25</u>	<u>1.97</u>	
Total capital costs	<u>40.44</u>	<u>165.12</u>	<u>205.56</u>	<u>5.06</u>	<u>20.65</u>	<u>25.71</u>	80%

Estimated Annual Expenditures (Capital and Recurrent)  
 (T Sh Millions)

Item	1979/80			1980/81			1981/82			1982/83			1983/84			1984/85			1985/86			TOTAL		
	Local	Foreign	Total	Local	Foreign	Total																		
A. Capital Expenditures																								
(a) Maintenance Equipment, incl. spare parts	3.38	46.38	49.76	2.09	27.12	29.21	1.49	15.57	17.06	-	-	-	-	-	-	-	-	-	-	-	6.96	89.07	96.03	
(b) Zonal Workshop Equipment	0.09	1.56	1.65	0.10	1.55	1.65	0.09	1.56	1.65	-	-	-	-	-	-	-	-	-	-	-	0.28	4.67	4.95	
(c) Construction or Road Camps	6.46	1.14	7.60	3.74	0.66	4.40	6.04	1.06	7.10	-	-	-	-	-	-	-	-	-	-	-	16.24	2.86	19.10	
(d) Road Maintenance Materials	0.63	1.48	2.11	0.77	1.79	2.56	1.74	1.65	3.39	-	-	-	-	-	-	-	-	-	-	-	3.14	4.92	8.06	
(e) Rehabilitation of Existing Regional Equipment - Pilot Program	-	-	-	0.10	1.66	1.76	0.10	1.66	1.76	-	-	-	-	-	-	-	-	-	-	-	0.20	3.32	3.52	
(f) Technical Assistance and Training																								
(i) Technical Assistance for planning and road maintenance	0.13	2.74	2.87	0.42	8.43	8.85	0.42	8.22	8.64	-	-	-	-	-	-	-	-	-	-	-	0.97	19.39	20.36	
(ii) Instructors for Morogoro Training School	0.02	0.40	0.42	0.08	1.58	1.66	0.07	1.38	1.45	-	-	-	-	-	-	-	-	-	-	-	0.17	3.36	3.53	
(iii) Training Aids	0.03	0.42	0.45	0.01	0.17	0.18	0.01	0.16	0.17	-	-	-	-	-	-	-	-	-	-	-	0.05	0.75	0.80	
(iv) Provision of housing for technical experts	1.50	1.00	2.50	0.90	0.60	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.40	1.60	4.00	
(v) Training of engineers	-	-	-	0.14	2.99	3.13	0.10	1.99	2.09	0.10	1.99	2.09	0.15	2.99	3.14	-	-	-	-	-	0.49	9.96	10.45	
Sub-total	12.24	55.12	67.36	8.35	46.55	54.90	10.06	33.25	43.31	0.10	1.99	2.09	0.15	2.99	3.14	-	-	-	-	-	30.90	139.90	170.80	
g) Contingencies																								
i) Physical on Items (c)-(f)	0.89	0.90	1.79	0.62	1.88	2.50	0.85	1.73	2.58	0.01	0.16	0.17	0.01	0.25	0.26	-	-	-	-	-	2.38	4.92	7.30	
ii) Price - Items (a) & (b)	0.39	3.16	3.55	0.49	3.74	4.23	0.53	3.43	3.96	-	-	-	-	-	-	-	-	-	-	-	1.41	10.15	11.74	
- Items (c) to (f)	1.06	0.58	1.64	1.49	2.89	4.38	3.07	3.94	7.01	0.04	0.91	0.95	0.09	1.65	1.74	-	-	-	-	-	5.75	9.97	15.72	
Sub-total	2.34	4.64	6.98	2.60	8.51	11.11	4.45	9.10	13.55	0.05	1.07	1.12	0.10	1.90	2.00	-	-	-	-	-	9.54	25.22	34.76	
TOTAL CAPITAL COSTS (NET OF TAXES)	14.58	59.76	74.34	10.95	55.06	66.01	14.51	42.35	56.86	0.15	3.06	3.21	0.25	4.89	5.14	-	-	-	-	-	40.44	165.12	205.56	
B. Recurrent Expenditures																								
a) Salaries and Wages	4.04	-	4.04	6.46	-	6.46	8.54	-	8.54	8.54	-	8.54	8.54	-	8.54	8.54	-	8.54	8.54	-	53.20	-	53.20	
b) Trainee Allowances (Morogoro)	1.31	-	1.31	1.31	-	1.31	1.31	-	1.31	1.31	-	1.31	1.31	-	1.31	1.31	-	1.31	1.31	-	9.17	-	9.17	
c) Office Overhead	0.27	-	0.27	0.39	-	0.39	0.49	-	0.49	0.49	-	0.49	0.49	-	0.49	0.49	-	0.49	0.49	-	3.11	-	3.11	
d) Equipment operation and hand tools																								
i) Fuel, oil, hand tools	1.96	4.57	6.53	3.26	7.62	10.88	4.24	9.90	14.14	4.15	9.68	13.83	4.04	9.44	13.48	4.00	9.33	13.33	4.00	9.33	13.33	25.65	59.87	85.52
ii) Replacement parts	-	-	-	0.17	2.89	3.06	0.18	3.00	3.18	0.62	10.48	11.10	0.18	3.00	3.18	0.18	3.00	3.18	0.18	3.00	3.18	1.51	25.37	26.88
Sub-total	7.58	4.57	12.15	11.59	10.51	22.10	14.76	12.90	27.66	15.11	20.16	35.27	14.56	12.44	27.00	14.52	12.33	26.85	14.52	12.33	26.85	92.64	85.24	177.88
e) Contingencies																								
i) Physical	0.76	0.46	1.22	1.16	1.05	2.21	1.48	1.29	2.77	1.51	2.02	3.53	1.46	1.24	2.70	1.45	1.23	2.68	1.45	1.23	2.68	9.27	8.52	17.79
ii) Price	0.84	0.50	1.34	2.56	1.97	4.53	4.89	3.50	8.39	6.60	7.26	13.86	8.04	5.66	13.70	9.82	6.87	16.69	11.76	8.21	19.97	44.51	33.97	78.48
Sub-total	1.60	0.96	2.56	3.72	3.02	6.74	6.37	4.79	11.16	8.11	9.28	17.39	9.50	6.90	16.40	11.27	8.10	19.37	13.21	9.44	22.65	53.78	42.49	96.27
TOTAL RECURRENT COSTS (NET OF TAXES)	9.18	5.53	14.71	15.21	13.53	28.84	21.13	17.69	38.82	23.22	29.44	52.66	24.06	19.34	43.40	22.79	20.43	46.22	27.73	21.77	49.30	146.42	127.73	274.15

3.21 Project costs have been derived as follows:

- (a) Road Maintenance, Rehabilitation and Zonal Workshop Equipment; Base and Road Camps; Road Maintenance Materials and Training Aids: based on actual costs and bid prices under the Fourth Highway Project and recent quotations from Tanzanian suppliers which were adjusted to reflect anticipated c.i.f. Dar es Salaam prices in January 1979, and have been found reasonable;
- (b) Rehabilitation of Existing Regional Equipment - Pilot Program: assessed as a notional amount of US\$440,000 for repair and rehabilitation of road maintenance equipment in two regions;
- (c) Technical Assistance and Training:
  - (i) Technical Assistance for Planning and Road Maintenance Program: includes 522 man-months over a 3-year period, at a net average of US\$4,900 per man-month, covering salaries, overhead, fees, and transportation, based on costs under the ongoing Fourth Highway Project and a Trucking Industry Project;
  - (ii) Instructors for Morogoro Training School: includes 90 man-months over a 3-year period, at a net average of US\$4,900 per man-month, covering salaries, overhead, fees, and transportation, based on costs under the ongoing projects;
  - (iii) Housing for Technical Experts: includes 16 Grade A houses in accordance with Government standards for housing expatriate technical assistance, which are satisfactory; based on bids under an ongoing IDA project, at a net average cost of US\$31,000 per house;
  - (iv) Training of Engineers: includes four years of training for about 120 students at an Indian or other appropriate university, at a net average of US\$2,750 per student per year. Costs are based on the actual costs of a similar program by the Tanzanian Ministry of Water, Energy and Minerals and updated by more recent information from the Indian Embassy in Tanzania;
- (d) Contingencies: the cost estimates include physical contingencies of 10% on all but road maintenance and workshop equipment and initial spare parts. In addition, a provision is made for price variation based on the following price escalation rates applied to local and foreign costs:

	Equipment		Civil Works and Technical Assistance and Training	
	Local	Foreign	Local	Foreign
	----- % -----		----- % -----	
1979	11.0	6.5	11.0	7.5
1980	10.0	6.0	10.0	7.0
1981	9.0	6.0	9.0	7.0
1982 to 1986	8.0	6.0	8.0	7.0

E. Financing

3.22 The proposed IDA credit would finance US\$20.5 million or over 99% of the foreign exchange component of the project's capital costs. The Government will finance the remaining capital costs of the project, US\$5.21 million, as well as recurrent expenditures estimated at US\$34.27 million equivalent over the estimated seven-year life of the equipment to be financed under the project.

F. Execution

3.23 The MOW, assisted by technical experts to be provided under the project, will be responsible for project execution. Under the decentralized system extant in Tanzania, all maintenance units will be supervised by Trunk Road Maintenance Engineers to be appointed by MOW. Regravelling and rehabilitation units, the bridge and culvert crew, the ancillary equipment unit and the specialized asphalt and quarrying units will be directly responsible to MOW. Project implementation is scheduled to start in mid-1979 and end in 1984, although the road maintenance equipment will continue to be operational through 1986. An implementation schedule (Chart 2), and detailed performance and output reporting requirements (Annex 4) were discussed with, and accepted as reasonable by, Government. Agreement was reached that a completion report, in a form satisfactory to the Association, will be submitted promptly after completion of the project, but in any event not later than three months after the Closing Date (para. 5.01(k)).

G. Procurement

3.24 The new road maintenance and workshop equipment (except as provided below) including a supply of spare parts, estimated to cost about US\$12.6 million equivalent, excluding contingencies, will be procured through international competitive bidding (ICB) in accordance with Bank Group Guidelines, with separate contracts for each type or group of similar types of equipment. Equipment suppliers will be required to provide an adequate organization for commissioning and warranty servicing, including warranty servicing in the field where equipment is based away from its Tanzanian headquarters. They will also

be required to maintain a reasonable inventory of spare parts in Tanzania and to provide training of mechanics, service personnel and equipment operators.

3.25 The training aids for the Morogoro Training School and the spare parts for rehabilitation of existing equipment for the Pilot Program, estimated to cost about US\$540,000 excluding contingencies, would involve a number of relatively minor individual purchases for specialized items that would not attract international competition. The technical assistance instructors will prepare details and specifications for the training aids required and after agreement with the Association the aids will be procured by calling competitive quotations from established suppliers within the country and abroad in accordance with Government procurement procedures which are satisfactory. For spare parts for the Pilot Program, estimated to cost US\$440,000 excluding contingencies, MOW will be assisted by the regions and project-financed technical experts to prepare a list of spare parts together with a program and estimates for repair and rehabilitation of existing regional equipment. Following discussion and agreement with the Association on the list of spare parts, the program and estimates (para. 5.01(f)), the required spare parts and repair services will be procured through local representatives of the equipment suppliers using local procurement procedures which are satisfactory. Road maintenance materials, estimated to cost US\$1.01 million excluding contingencies, will be procured through ICB in accordance with Bank Group Guidelines. Base and road camps, plans for which will be reviewed by the Association (paras. 3.11 and 5.01(d)), are estimated to cost about US\$2.39 million excluding contingencies. The camps will be simple, mainly requiring only low-standard construction, and will be located in various rural locations. Since their construction is unlikely to attract international competition, they will be built by local contractors after local competitive bidding or, if the Association should so agree, by force account. Housing for technical experts, estimated to cost about US\$500,000 excluding contingencies, will be located in Dar es Salaam and several rural centers and is unlikely to attract international competition. Houses will be built by local contractors after competitive bidding, or if the Association should so agree, by force account.

3.26 Government has agreed that the road maintenance and rehabilitation equipment, including related workshop equipment, spare parts and tools, will only be deployed for use after: (a) for the ancillary plant pool, the advisor to the Mechanical Supervisor is in post; and (b) for road maintenance, rehabilitation and regravelling crews, the respective advisors for the trunk road maintenance superintendents, roadworks superintendents and equipment service managers are in post (para. 5.01(1)). Procurement of off-the-shelf items costing less than US\$15,000 each may follow normal Government procurement procedures and conditions which are acceptable to the Association; the total amount of such purchases should not exceed US\$200,000. Agreement to this effect was obtained from Government (para. 5.01(m)).

H. Disbursements

3.27 Credit funds will be disbursed on the following basis:

- (a) 100% of foreign expenditures for road maintenance and zonal workshop equipment and vehicles, materials, tools, training aids and spare parts imported directly from abroad;
- (b) 70% of expenditures for road maintenance and zonal workshop equipment and vehicles, materials, tools, training aids and spare parts imported and procured locally;
- (c) 15% of total expenditures for road camp construction;
- (d) 100% of foreign expenditures for technical assistance and training costs;
- (e) 40% of total expenditures for housing constructed for technical experts; and
- (f) retroactive financing of US\$40,000 to cover the cost of employing up to three technical experts for about two months prior to Credit signing for project implementation planning and procurement document preparation.

All disbursements would be fully documented, although if MOW undertakes work by force account for categories (c) and (e), disbursements would be made against statements of expenditure to be certified by the Director of Roads and Aerodromes of MOW; these would be retained by MOW and made available to IDA for inspection in the course of normal project supervision.

3.28 A schedule of estimated disbursements is shown below.

Estimated Schedule of Disbursements

<u>IDA Fiscal Year and Quarter</u>	<u>Cumulative Disbursement at end of Quarter</u> (US\$ thousands)
<u>1979/80</u>	
First	50
Second	100
Third	200
Fourth	500
<u>1980/81</u>	
First	1,000
Second	2,000
Third	3,500
Fourth	5,100
<u>1981/82</u>	
First	7,000
Second	8,000
Third	9,000
Fourth	10,200
<u>1982/83</u>	
First	11,000
Second	12,000
Third	13,000
Fourth	14,300
<u>1983/84</u>	
First	16,000
Second	17,000
Third	18,000
Fourth	19,000
<u>1984/85</u>	
First	20,000
Second	20,500

Source: Mission estimates, 1978.

I. Environmental Aspects

3.29 The project is not expected to have any detrimental impact on the environment. In fact, soil erosion on project roads will be less than at present as drainage facilities (culverts, ditches) are rehabilitated and better maintained. Also, dust formation on the project roads during the dry season will be lower as a result of an adequate layer of gravel on the roads; improved visibility, safety and comfort should result.

#### IV. ECONOMIC EVALUATION

##### A. Introduction

4.01 The two main objectives of the proposed project are: (a) to improve the condition of the trunk road network in northern and western Tanzania in order to reduce transport costs and to promote economic development; and (b) to increase the country's long-run road maintenance capability through formal education and on-the-job training of local road maintenance personnel at all levels. These are essentially the same objectives as those of the ongoing highway maintenance project which focuses on the eastern and southern half of the country.

4.02 Proper maintenance of roads is vital in Tanzania where major upgrading is often not justified because of low traffic levels, yet the widely scattered population must rely solely on roads to transport agricultural inputs (fertilizer, seeds, etc.) and production as well as to reach health and education facilities and other Government services. The project encompasses an area of 500,000 sq km (see map) with a population of 8 million and a marketed agricultural production of a million tons a year (60% of the national total). The main marketed products, accounting for some 800,000 tons annually, are: cereals (maize, wheat), cassava/potatoes, bananas and cotton. Other important products are: sugar, coffee, beans, and sisal. Roads included in the project have been identified by Government and IDA staff as crucial transport arteries in the areas served and in conditions warranting urgent routine or periodic maintenance.

4.03 The area's agricultural potential is currently being assisted by projects funded by several bilateral and multilateral agencies. The Association is helping in this effort by financing a tea project (Cr. 287-TA), a livestock project (Cr. 382-TA), three rural development projects in Kigoma (Cr. 508-TA), Tabora (Cr. 703-TA), and Mwanza/Shinyanga (Cr. 803-TA), three tobacco projects (Cr. 217-TA, Cr. 658-TA, Cr. 802-TA), the Geita Cotton project (Cr. 454-TA), a dairy project (Cr. 580-TA), and a national maize project (Cr. 606-TA).

##### B. Benefits and Beneficiaries

4.04 Benefits have been calculated for the rehabilitation (1,440 km) and regravelling (600 km) of earth or gravel roads as well as the routine maintenance of 600 km of bitumen roads, and consist of savings in vehicle operating costs (VOC) for the projected traffic using the roads so maintained. These savings will directly accrue to transport operators, both private and public, and thereafter will be passed on to transport users, mainly farmers and bus passengers, since rates and fares for intercity road transport are generally cost-based as a result of competition between transporters.

4.05 Benefits of helping to create a road maintenance capability in Tanzania are not quantified, but in the long-run economic as well as political perspective are probably at least as important as the short-term benefits resulting from upgrading the road network and reducing transport costs. Also unquantified are the benefits that transport users will reap in the form of a more reliable, faster, and, in the case of passengers, more comfortable transport service.

C. Economic Analysis

4.06 Total vehicle operating cost savings were calculated for the 7-year period corresponding to the economic life of the equipment financed under the project. To quantify these savings, vehicle operating costs (such as fuel and oil consumption, tire wear, vehicle maintenance and depreciation) were first estimated for various vehicle types (passenger cars, pickups/landrovers, 9-ton trucks and 50-passenger buses) on two road types (bitumen and gravel), considering road condition (good, fair and poor) and taking into account the type of terrain (flat to rolling and rolling to hilly).

Vehicle Operating Costs  
(T Sh/100 veh-km)

Type and Condition of Road	Cars	Pickups/ Landrovers	Trucks (9-ton)	Buses (50 Passengers)
A. Flat to Rolling Terrain				
Bitumen:				
- Good	68	77	198	214
- Fair	85	97	247	267
- Poor	116	132	336	362
Gravel				
- Good	79	91	255	279
- Fair	104	118	332	363
- Poor	139	160	447	489
B. Rolling to Hilly Terrain				
Bitumen:				
- Good	70	79	200	216
- Fair	89	100	251	270
- Poor	121	136	340	368
Gravel				
- Good	82	93	274	284
- Fair	106	121	357	369
- Poor	143	163	480	497

Note: Costs are net of taxes and duties.

Source: Lyon Associates, Inc., "Economic and Engineering Study, Tanzania Highway Maintenance and Organization", 1972; Japan International Cooperation Agency, "Vehicle Operating Costs on Southern Link Road Project", 1976; and mission estimates.

4.07 Unit savings were then calculated for each of the roads to be rehabilitated, regravelled or maintained under the project. As a result of rehabilitation, regravelling or routine maintenance, the road condition is restored to "good" and savings in vehicle operating costs are realized. 1/ These unit savings were then multiplied by the projected traffic volumes taking into account the actual traffic volumes on the road in 1977 (Annex 1), plus a 3% annual growth rate thereafter, based on the expected growth in agricultural production, population, and income in the area. On the basis of these benefits, the capital costs of the project, and the additional recurrent cost to be incurred, the project's economic rate of return is 70% and the benefit/cost ratio is 2.8:1 assuming a 10% cost of capital. Introduction of a shadow rate of exchange (50% above the official rate: T Sh 12 per US dollar) does not affect the project's economic rate of return or the benefit/cost ratio.

Economic Costs and Benefits of the Project  
(T Sh million)

<u>Year</u>	<u>Capital Costs</u>	<u>Increased Recurrent Costs</u>	<u>Savings in Vehicle Operating Costs</u>	<u>Net (Costs) Benefits</u>
1980	71.3	10.9	-	(82.2)
1981	58.3	19.3	79.1	1.5
1982	45.4	21.7	113.3	46.2
1983	1.9	29.4	147.9	116.6
1984	2.9	19.3	173.1	150.9
1985	-	18.3	197.4	179.1
1986	-	18.0	199.4	181.4
1987	(17.4) <u>2/</u>	-	206.3	223.7

Economic Rate of Return = 70%

Benefit/Cost Ratio = 2.8:1 (based on 10% discount rate)

Sensitivity analysis:

Cost 25% up

Savings 20% down

Economic Rate of Return = 39%

Benefit/Cost Ratio = 1.8:1 (based on 10% discount rate)

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1/ Unit vehicle operating costs savings for "gravel" roads (see table, para. 4.06) have been used in calculating the savings resulting from upgrading "gravel or earth" roads. This, of course, leads to some underestimation of the savings which will actually be realized.

2/ Residual value of equipment.

4.08 In addition, a separate analysis was made of costs and benefits of the "marginal" road sections included in the rehabilitation and regravelling program (see table on page 23), i.e., those sections which have the lowest priority (and return) and are scheduled for implementation in 1986. The marginal road section in the rehabilitation program (RU-1) yields a rate of return of 13% (a benefit/cost ratio of 1.1:1 based on a 10% discount rate) while the marginal section in the regravelling program (AR-4) has a return of 38% (a benefit/cost ratio of 1.9:1 based on a 10% discount rate) and both are thus economically justified on their own merits.

#### D. Risks

4.09 Because of the project's high rate of return, the risk of misallocation of resources is minimal. No special problems are expected in the procurement of equipment; delays in procurement, as were experienced under the ongoing Fourth Highway project, are expected to be avoided because experience in procurement was gained under that project and a procurement adviser will be provided under the proposed project. The cost estimates, as they are based on recent quotations, bids and costs, plus the contingencies provided for, should cover actual expenditures. Barring a major national economic setback or a drastic change in national priorities, Government should be in a position to provide the necessary local finance (capital and recurrent) to implement the project on schedule, especially since the 1977/78 recurrent budget allocation for road maintenance was underspent. Unit vehicle operating cost savings are conservatively estimated and probably underestimate the actual unit savings. Traffic projections are admittedly uncertain, but chances of a significant overestimation are slim since the projections are based on available actual traffic counts in combination with a modest annual growth rate (3%) over a relatively short period of time (until 1987).

4.10 However, based on experience with the ongoing highway maintenance project, staffing arrangements pose some risk. Consultants may be slow in providing the appropriate experts while Government may encounter delays in expanding its maintenance staff and providing the counterparts to be trained. In addition, selection of candidates to be trained as operators may be slow or otherwise less than optimal. This risk remains although the recent assignment and posting of most of the required local staff under the Fourth Highway Project indicates an increasing Government concern with improving road maintenance and a commitment to providing the necessary staff and other resources which minimize the risk to the proposed project. Other project features are also designed to minimize this risk; that is, close monitoring of project implementation; the project design which includes retroactive financing of "advance" experts to help Government prepare the implementation; inclusion of a housing element; and conservative productivity estimates for the rehabilitation, regravelling and routine maintenance units. But, even if staffing problems arise in the future and cause the output of maintenance to fall below the projected levels, the project benefits would still be acceptable as indicated in the following sensitivity analysis.

4.11 Assuming a 25% increase in costs (capital and recurrent) and a decrease of 20% in benefits (VOC savings), the rate of return declines from 70% to 39% and the benefit/cost ratio from 2.8:1 to 1.8:1. Even under these assumptions, the project remains economically justified and still has a comfortable safety margin. Costs could rise by a further 98% or benefits be lower by a further 35% before the project would become marginal, i.e., would have a rate of return of 10% (or a benefit/cost ratio of 1:1).

V. AGREEMENTS REACHED AND RECOMMENDATIONS

5.01 Agreement has been reached that Government will:

- (a) make regular and systematic traffic counts on the trunk road system (para. 2.02);
- (b) by March 31, 1979 adopt a management system including operational guidelines which would enable MOW to determine and exercise full authority over trunk road maintenance programs and to control trunk road maintenance equipment. It was also agreed that Government, in consultation with the Association, would develop a program to implement the management system (para. 2.13);
- (c) progressively apply and continue to apply its increased road maintenance capability to the maintenance of its trunk road system in accordance with sound engineering practice and will promptly provide the funds required (para. 2.21);
- (d) submit for review a detailed annual project implementation program to the Association by April 30 of each year during project implementation, starting in 1979 (paras. 3.05 and 3.11);
- (e) during project implementation, submit to the Association for its review and approval technical specifications and lists of equipment to be purchased for zonal workshops (para. 3.10);
- (f) by December 31, 1979 submit to the Association for its review and approval a detailed implementation program for the Pilot Regional Program, including a list of spare parts for repair and rehabilitation of existing regional equipment and a plan for deploying technical assistance (paras. 3.13 and 3.25);
- (g) employ suitably qualified technical experts under terms and conditions satisfactory to the Association (paras. 3.17-3.18);

- (h) appoint all local staff, having qualifications and experience satisfactory to the Association, to each position in MOW's Road Maintenance Section for which advisors are to be provided, prior to the date when such advisors are employed but in any event not later than December 31, 1979 (para. 3.17);
- (i) review MOW's staffing in order to improve manpower allocation and utilization within the Ministry and by March 31, 1979 furnish the results and recommendations of that review to the Association for comment (para. 3.17);
- (j) by June 1, 1979 make arrangements satisfactory to the Association for the training for MOW of about 120 high school graduates in an engineering program at appropriate institutions of higher education (para. 3.19);
- (k) submit a completion report, in a form satisfactory to the Association, promptly after completion of the project, but in any event not later than three months after the Closing Date (para. 3.23);
- (l) only deploy road maintenance and rehabilitation equipment, including related workshop equipment, spare parts and tools, after the related key technical experts are in post (para. 3.26); and
- (m) follow normal Government procurement procedures and conditions, which are acceptable to the Association, for procurement of off-the-shelf items costing less than US\$15,000 each; the total amount of such purchases should not exceed US\$200,000 (para. 3.26);

5.02 It will be a condition of Credit effectiveness that advisors to the Maintenance Management Engineer, the Maintenance Administrator and the Plant and Procurement Engineer have been recruited and are in post (para. 3.16).

5.03 It will be a further condition of Credit effectiveness that MOW executive staff, having qualifications and experience satisfactory to the Association, have been appointed and are in post for the positions of Maintenance Management Engineer, Maintenance Administrator, Plant and Procurement Engineer, Mechanical Supervisor, one Trunk Road Maintenance Superintendent and one Roadworks Superintendent (para. 3.17).

5.04 It will be a condition of Credit disbursement for all technical assistance to the Morogoro Training School that a two-year program, satisfactory to the Association, will have been prepared for the recruitment and training of trainees to attend the School (para. 3.18).

5.05 Government has also confirmed that it will annually review with the Association the sufficiency of allocated road maintenance funds. For fiscal years 1980 through 1983, Government confirmed that a reasonable estimate of the funds required annually would be T Sh 106 million, T Sh 115 million, T Sh 118 million and T Sh 126 million, respectively, in January 1979 prices. Government has also confirmed that it will maintain an adequate level of expenditures in real terms, for trunk road maintenance in the period after project implementation (para. 2.21).

5.06 With the agreements and under the conditions outlined above, the project is suitable for an IDA Credit of US\$20.5 million on standard terms to the Government of Tanzania.

December 27, 1978

TANZANIA

FIFTH HIGHWAY PROJECT

Road Inventory and Vehicle Operating Cost Savings

<u>Region</u>	<u>Code</u>	<u>Road Section</u>	<u>Km</u>	<u>Surface Type</u>	<u>Cond.</u>	<u>Terrain</u>	<u>Traffic vpc, 1977</u>	<u>Veh. Op. Cost. Savings per km 1977<sup>3/</sup></u> (T Sh'000)
<u>ARUSHA</u>	*** AR-1	Arusha-Namanga	99	B	F	F	248	28.3
	*** AR-2	Arusha-Makuyuni	75	B	F	R	402	54.8
	*** AR-3 (i)	Makuyuni-Babati	32	B	F	H	118	16.7
	** (ii)	" "	60	G	P	H	118	64.6
	** AR-4	Babati-Dodoma Border	42	G	P	R	33	17.4
	*** AR-5	Kilimanjaro Border-Arusha	50	B	P	F/R	1,363	417.8
	* AR-6	Babati-Singida Border	129	G	P	R/H	68	36.3
	* AR-7 (i)	Makuyuni-Serengeti Park Gate	70	G	P	R/H	160	80.8
	* (ii)	" " "	21	G	P	R/H	62	25.6
	*** (iii)	" " "	69	G	P	R/H	10	3.4
Total				<u>647</u>				
<u>DODOMA</u>	*** DO-1 (i)	Dodoma-Arusha Border	11	B	F	F/R	133	17.4
	** (ii)	" "	210	G	P	F/R	46	26.7
	*** DO-2 (i)	Dodoma-Iringa Border	2	B	F	F/R	94	12.9
	* (ii)	" "	140	G	P	F/R	94	49.7
	*** DO-3 (i)	Dodoma-Gairo	2	B	F	F/R	165	22.5
	* (ii)	" "	136	G	P	F/R	112	58.0
	*** DO-4 (i)	Dodoma-Bahi	6	B	F	R/H	73	10.7
	* (ii)	" "	52	G	P	R/H	73	41.5
	Total				<u>559</u>			
	**** KG-1	Kanyani-Nyantwiga	230	G	P	R/H	23	10.7
<u>KIGOMA</u>	**** KG-2	Kanyani-Msobwe	70	G	P	R/H	5	2.7
	*** KG-3 (i)	Kigoma-Kanyani	6	B	F	R/H	60	7.3
	*** (ii)	" "	77	G	F	R/H	60	10.6
	Total				<u>383</u>			
	*** KL-1	Himo-Mkomazi	153	B	F	F/R	502	65.4
<u>KILIMANJARO</u>	*** KL-2	Himo-Moshi	23	B	F	F/R	892	104.4
	*** KL-3	Moshi-Arusha Border	35	B	F	F/R	941	103.3
	*** KL-4	Himo-Kibou	60	G	F	R/H	84	13.8
	*** KL-5	Himo-Taveta	17	B	F	R/H	84	9.4
	Total				<u>288</u>			
<u>MARA</u>	MA-L	Bunda-Mwanza Border	21	Under Construction				
	** MA-2	Bunda-Sirari	154	G	P	R/H	72	37.5
	Total				<u>175</u>			

Asterisks indicate roads identified as high priority and included under the Project for:

- \* rehabilitation and subsequent routine maintenance;
- \*\* regravelling and subsequent routine maintenance;
- \*\*\* routine maintenance only; and
- \*\*\*\* routine maintenance only, as maintenance units increase their capacity (see para. 3.06)

1/ Surface Type (1978): B=Bitumen; G=Gravel or Earth  
Surface Condition (1978): G=Good; F=Fair; P=Poor

2/ Terrain: F=Flat; R=Rolling; H=Hilly

3/ Total annual vehicle operating cost savings per km, in 1977, if roads would have been in good condition.

<u>Region</u>	<u>Code</u>	<u>Road Section</u>	<u>Km</u>	<u>Surface Type</u>	<u>Cond.</u>	<u>Terrain</u> <sup>2/</sup>	<u>Traffic vpd. 1977</u>	<u>Veh. Op.Cost km, 1977</u> <sup>3/</sup> (T Sh'000)	<u>Savings per km, 1977</u> <sup>3/</sup> (T Sh'000)
<u>MWANZA</u>	* MW-1	Geita-Katoro	30	G	P	F/R	66	31.5	
	* MW-2	Geita-Usagara	106	G	P	F/R	90	50.2	
	*** MW-3 (i)	Usagara-Mwanza-Mara Border	58	B	F	F/R	181	24.5	
	(ii)	" " "	98	Under construction					
	*** MW-4	Usagara-Shinyanga Border	75	G	F	F/R	164	31.8	
	Total				<u>367</u>				
<u>RUKWA</u>	* RU-1	Msobwe-Mpanda	187	G	P	R/H	29	12.1	
	**** RU-2	Mpanda-Kisi	115	G	P	R/H	11	4.3	
	**** RU-3	Mpanda-Tabora Border	195	G	P	F/R	10	5.0	
	Total				<u>497</u>				
<u>SHINYANGA</u>	*** SH-1	West Lake Border-Buhegela	185	G	F	F/R	34	7.1	
	*** SH-2 (i)	Mwanza Border-Tabora Border	3	B	F	F/R	121	16.2	
	*	(ii) " " "	103	G	P	F/R	121	62.2	
	Total				<u>291</u>				
<u>SINGIDA</u>	*** SI-1 (i)	Singida-Bahi	3	B	P	R/H	119	45.2	
	*	(ii) " "	163	G	P	R/H	78	44.3	
	*** SI-2 (i)	Singida-Shinyanga Border	2	B	P	F/R	73	28.8	
	*	(ii) " "	115	G	P	F/R	73	39.5	
	*** SI-3 (i)	Singida-Arusha Border	4	B	P	R/H	95	33.4	
	*	(ii) " "	56	G	P	R/H	95	45.9	
	**** SI-4	Rungwa-Kilumbi	85	G	P	R/H	10	4.5	
	**** SI-5	Jiwe-la-Singa-Issuna	105	G	P	R/H	10	4.5	
	Total				<u>533</u>				
<u>TABORA</u>	*** TA-1	Nzega-Singida Border	103	G	F	F/R	85	18.0	
	* TA-2	Nzega-Buhegela	57	G	P	F/R	47	23.8	
	* TA-3	Nzega-Shinyanga Border	31	G	P	F/R	85	43.9	
	*** TA-4 (i)	Nzega-Tabora	4	B	F	F/R	98	12.2	
	*	(ii) " "	111	G	P	F/R	73	35.9	
	**** TA-5	Ipole-Rukwa Border	85	G	P	F/R	10	5.0	
	**** TA-6	Tabora-Rungwa	278	G	P	F/R	14	6.1	
	**** TA-7	Kilumbi-Jiwe-la-Singa	40	G	P	R/H	10	4.5	
	Total				<u>709</u>				
<u>WEST LAKE</u>	*** WL-1 (i)	Bukoba-Kyaka	4	B	F	R/H	115	14.1	
	*	(ii) " "	44	G	P	R/H	115	53.0	
	* WL-2	Kyaka-Mutukula	31	G	P	R/H	39	19.3	
	*** WL-3 (i)	Bukoba-Mulemba	17	B	F	R/H	303	33.7	
	**	(ii) " "	42	G	P	R/H	203	92.7	
	** WL-4	Mulemba-Biharamulo	115	G	P	R/H	39	22.2	
	*** WL-5	Biharamulo-Nyakanazi	58	G	P	R/H	28	15.4	
	WL-6	Nyakanazi-Nyantwiga	29	G	P	R/H	11	5.7	
	*** WL-7 (i)	Nyakanazi-Shinyanga Border	1	B	F	F/R	10	1.6	
	***	(ii) " "	51	G	F	F/R	10	2.4	
	*** WL-8	Biharamulo-Katoro	88	G	P	F/R	30	11.9	
	**** WL-9	Rulenge-Nzaza	40	G	P	R/H	20	9.4	
	WL-10	Lusahunga-Rulenge-Rusumo Falls	140	Under construction					
	Total				<u>660</u>				

For notes, see page 1 of this annex.

Source: Ministry of Works, Ministry of Communications and Transport, and Mission estimates.

December 1978

TANZANIAFIFTH HIGHWAY PROJECTEquipment to be Purchased

Item	Number	Unit (cif) Cost 1/		Total Foreign Cost 1/	
		T Sh '000	US\$	T Sh '000	US\$
Air Tools (sets)	4	7.9	986	31.6	3,944
Angle-dozer with ripper (100-110 HP)	6	532.2	66,525	3,193.2	399,150
Angle-dozer with ripper (180-220 HP)	1	1,022.4	127,800	1,022.4	127,800
Bridges (emergency, lightweight)	2	498.0	62,250	996.0	124,500
Car, Saloon	1	49.8	6,225	49.8	6,225
Compactor:					
- pneumatic tired, 9 wheel, 8-10t	6	286.8	35,847	1,720.8	215,082
- steel drum, self-propelled, 6-8t	16	190.1	23,759	3,041.6	380,144
- vibrating with trailer, 3/4t	6	60.3	7,542	361.8	45,252
- vibrating drum and wheel, 6-8t	4	373.5	46,688	1,494.0	186,752
Compressor: - 250 c.f.m.	2	91.3	11,413	182.6	22,826
Crusher:					
- 10t/hour - primary crusher	1)				
- secondary crusher	1)				
Vibrating screens					
- screen deck	1)	440.4	55,051	440.4	55,051
- diesel motor for crushers and screens	1)				
Grader: - motor (115-135 HP)	26	563.8	70,477	14,658.8	1,832,402
Laboratory: - soils and materials - field model	1	1,660.0	207,500	1,660.0	207,500
Loaders:					
- front-end - wheeled - 1.5m <sup>3</sup>	1	470.2	58,785	470.2	58,785
- wheeled - 2.0m <sup>3</sup>	7	633.2	79,151	4,432.4	554,057
- track-mounted - 1.75m <sup>3</sup>	1	621.2	77,657	621.2	77,657
Minibus	2	66.4	8,300	132.8	16,600
Mixer: concrete, 300 l., towed	1	97.9	12,243	97.9	12,243
Pulvimer	1	166.0	20,750	166.0	20,750
Pump: - water, 3"	29	12.3	1,536	356.7	44,544
Radio - two-way communication system	1	1,660.0	207,500	1,660.0	207,500
Sprayer:					
- paint (sets)	2	4.1	519	8.2	1,038
- bitumen, heater	1	102.2	12,782	102.2	12,782
Spreader: - chipping (towed)	1	27.3	3,424	27.3	3,424
Storage heater - bitumen	1	111.6	13,954	111.6	13,954
Survey equipment (set)	1	83.0	10,375	83.0	10,375
Tanks - water (8,000 l.)	1	67.4	local	procurement	
- fuel storage (4,000 l.)	28	20.8	local	procurement	
Tools - mechanics (sets)	25	8.3	1,038	207.5	25,950
- senior mechanics (sets)	2	18.2	2,283	36.4	4,566
Tractors - industrial (80 HP)	22	191.7	23,966	4,217.4	527,252
Tractor attachments - bucket	22	29.0	3,631	638.0	79,882
- mower (scythe-type)	22	10.6	1,328	233.2	29,216
- back-hoe	2	45.2	5,654	90.4	11,308
Trailer - caravan	8	50.2	6,277	401.6	50,216
- platform 2m <sup>3</sup> /3t	22	16.6	2,075	365.2	45,650
- tilt-top 20t	1	82.3	10,282	82.3	10,282
- water-tank, 2,000 l.	29	26.0	local	procurement	
Vehicles - truck - breakdown with crane	1	290.5	36,313	290.5	36,313
- flat-bed, 7t	3	106.3	13,280	318.9	39,840
- fuel-tank, 6,000 l.	4	191.7	23,966	766.8	95,864
- long wheel base, 10t with crane	2	298.0	37,246	596.0	74,492
- mobile workshop	5	542.1	67,832	2,713.5	339,160
- pick-up, 3/4t	12	38.9	4,866	466.8	58,392
- pick-up, utility (4 x 4)	51	110.3	13,783	5,625.3	702,933
- tipper, 7t	103	187.3	23,411	19,291.9	2,411,333
- tractor, tandem with low-loader	2)				
- trailer (35t)	2)	725.4	90,678	1,450.8	181,356
- water tank (4,000 l.)	11	153.2	19,152	1,685.2	210,672
Vibrators - concrete, 1 1/2"	3	3.3	415	9.9	1,245
Washing and screening unit (45t/hr.)	1	295.9	36,987	295.9	36,987
Welder (300 amp.)	1	32.5	4,067	32.5	4,067
(600 amp.)	1	49.8	6,225	49.8	6,225
Miscellaneous items - (approx. 5%)	1	539.5	67,438	539.5	67,438
				77,527.8	9,690,976
Spare parts 15% on equipment and tools)				1,443,275	
10% on radio )					
Total				11,134,251	

1/ Costs are based on estimated prices at January 1979 and an exchange rate of T Sh 8 = US\$1.

TANZANIA

FIFTH HIGHWAY PROJECT

Composition and Equipping of Units

Routine Maintenance Unit - Gravel/Earth Roads (16 No.)

Equipment  
1 Compactor - steel drum, self propelled, 6-8t  
1 Grader - motor (115-135 HP)  
1 Pump, water, 3"  
1 Tank - fuel storage, 4,000 l.  
1 Tools, mechanics (set)  
1 Tractor, industrial, 80 HP w/ bucket & mower  
1 Trailer, platform, 2m<sup>3</sup>/3t  
1 Trailer, water tank, 2,000 l.  
2 Trucks, tippers 7t  
1 Truck, pick-up, 4 x 4 utility

Personnel

1 Foreman  
3 Plant operators  
1 Plant attendant  
3 Drivers  
1 Mechanic - Grade III  
20 Laborers  
1 Timekeeper/Clerk

Routine Maintenance Unit - Bitumen (6 No.)

Equipment  
1 Compactor, vibrating 3/4t (with trailer)  
1 Pump, water, 3"  
1 Tank, fuel storage, 4,000 l.  
1 Tools, mechanics (set)  
1 Tractor, Industrial, 80 HP w/ bucket & mower  
1 Trailer, Platform, 2m<sup>3</sup>/3t  
1 Trailer, water tank, 2,000 l.  
2 Trucks, tipper, 7t  
1 Truck, pick-up, 3/4t

Personnel

1 Foreman  
2 Plant operators  
3 drivers  
1 Mechanic - Grade III  
20 Laborers  
1 Timekeeper/Clerk

Regraveling Unit (2 No.)

Equipment  
1 Angle-dozer with ripper (100-110 HP)  
1 Compactor, pneumatic- tired, self-propelled, 8-10t  
1 Grader, motor (115-135 HP)  
1 Loader, wheeled, 2m<sup>3</sup>  
1 Pump, water, 3"  
1 Truck, water tank, 4,000 l.  
2 Trucks, pick-up, 4 x 4 utility  
1 Tools, mechanics (set)  
1 Trailer, caravan  
7 Trucks, tipper, 7t  
1 Trailer, water tank, 2,000 l.  
1 Tank, fuel storage, 4,000 l.

Personnel

1 Foreman  
4 Operators  
10 Drivers  
1 Mechanic - Grade II  
2 Mechanics - Grade III  
1 Plant attendant  
20 Laborers  
1 Storekeeper  
1 Timekeeper/Clerk

Rehabilitation Unit - Gravel/Earth Roads (4 No.)

Equipment  
1 Angle-dozer (100-110 HP)  
1 Compactor - pneumatic tired, 8-10t  
1 Compactor - vibrating drum and wheel 6-8t  
2 Graders - motor (115-135 HP)  
1 Loader - front-end, wheeled, 2m<sup>3</sup>  
1 Pump, water, 3"  
1 Tank, fuel storage, 4,000 l.  
1 Truck, fuel tank, 6,000  
1 Truck, water tank, 4,000 l  
1 Truck, mobile workshop  
10 Trucks, tipper, 7t  
2 Trucks, pick-up, 4 x 4 utility  
1 Trailer, caravan  
1 Trailer, water tank, 2,000 l.

Personnel  
1 Inspector  
2 Foremen  
6 Operators  
2 Plant attendants  
1 Mechanic - Grade I  
1 Mechanic - Grade II  
4 Mechanics - Grade III  
1 Welder - Grade II  
1 Electrician - Grade II  
2 Helpers - Grade II  
1 Storekeeper  
14 Drivers  
30 Laborers  
1 Timekeeper/Clerk

Bridge and Culvert Unit (1 No.)

Equipment  
2 Air tools (sets)  
1 Compressor (250 cfm)  
1 Loader, front-end, wheeled 1.5m<sup>3</sup>  
1 Mixer, concrete, 300 l.  
1 Pump, water 3"  
1 Tools, mechanics, (set)  
2 Trailer, caravan  
1 Trailer, water tank, 2,000 l.  
1 Truck, flat-bed, 7t  
1 Truck, tipper, 7t  
2 Trucks, pick-up, 4 x 4 utility  
3 Vibrators, concrete, 1½"  
2 Sprayer, paint  
1 Welder, 300 amp.

Personnel

1 Foreman  
2 Operators  
1 Welder - Grade II  
1 Carpenter - Grade II  
4 Drivers  
1 Mechanic - Grade II  
3 Helpers - Grade III  
15 Laborers  
1 Timekeeper/Clerk

Ancillary Equipment (1 No.)

Equipment  
2 Air tools (sets)  
1 Angle-dozer with ripper (180-220 HP)  
2 Bridges - emergency lightweight  
1 Compressor, 250 cfm.  
1 Crusher 10t/hr. - primary  
- secondary  
- screen deck  
1 Laboratory - soils and materials - field unit  
1 Loader, Front-end, wheeled, 2.0m<sup>3</sup>  
1 Loader, Front-end, tracked, 1.75m<sup>3</sup>  
1 Pulvimer, towed  
1 Sprayer, bitumen heater, 1,000 l.  
1 Spreader, chipping, towed  
1 Storage heater, bitumen (2,000 l.)  
1 Survey equipment (set)  
1 Tank, water, 8,000 l.  
1 Tank, fuel storage, 4,000 l.  
2 Tools, senior mechanics (sets)  
2 Tractor attachments (back-hoes)  
1 Trailer - tilt-top, 20t  
2 Truck-tractors with 35t low-loader trailers  
1 Truck, breakdown with crane  
2 Trucks, 10t, Long-wheel base with crane  
2 Trucks, flat-bed, 7t  
4 Trucks, tipper, 7t  
1 Truck, water-tank, 4,000 l.  
1 Truck, mobile workshop  
2 Trucks, pick-up, 3/4t  
4 Trucks, pick-up, 4 x 4 utility  
1 Washing and screening plant (40t/hr.)  
1 Welder, 600 amp.  
Miscellaneous items (5%)

Headquarters and Supervisory Staff

Equipment  
1 Saloon car (1600 cc)  
17 Trucks, pick-up, 4 x 4 utility  
4 Trucks, pick-up, 3/4t  
2 Minibuses  
1 Radio, 2-way communication system

Personnel

1 Inspector  
1 Foreman - mechanic  
1 Mechanic - Grade I  
2 Mechanics - Grade II  
4 Mechanics - Grade III  
1 Welder - Grade I  
1 Electrician - Grade I  
2 Helpers - Grade III  
12 Drivers  
4 Operators  
1 Storekeeper  
2 Timekeeper/Clerks  
10 Laborers

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STAFF APPRAISAL REPORT

Project Progress Reporting Requirements

1. Progress Reports should be submitted quarterly in triplicate no later than one calendar month after the end of the quarter. The first report should cover the quarter ending March 31, 1979.

2. The Report should contain the following information:

I. General Information

(a) Physical progress accomplished to date of report and during the reporting period for:

(i) Procurement

- preparation of specifications, bidding documents;
- calling and submission of bids;
- evaluation of bids and submission for IDA review;
- issuing of purchase contracts;
- delivery of procured items;
- payment to suppliers.

(ii) Technical Assistance

- preparation of terms of reference;
- prequalification of firms;
- calling for and submission of proposals;
- evaluation of proposals and submission for IDA review;
- award of contract;
- recruiting and approval of individual experts;
- proposed and actual arrival dates;
- man-months of service for each expert and total.

(iii) Training - Morogoro Training School

- preparation of training schedule;
- preparation of curricula;
- nomination and selection of trainees;
- courses held and numbers trained;
- results and standards achieved.

(iv) Engineer Training

- status of discussions and agreement (with Government of India and/or other entities);
- preparation of proposal including number to be trained and timetable;
- nomination and selection of students;
- students under training;
- results of training.

(v) Construction of Road Camps

- selection of sites;
- design of camps and preparation of contract documents;
- acquisition of land;
- calling and receipt of bids;
- evaluation of bids and submission for IDA review;
- award of contracts;
- progress of construction.

(vi) Construction of Housing

- selection of sites;
- design and specifications;
- construction;
- schedule for housing completion;
- occupation of houses by expatriates.

(vii) Rehabilitation of Existing Equipment (Regional)

- survey and assessment of existing equipment;
- preparation of repair requirements and spare parts lists;
- procurement of spare parts;
- repairs in progress and completed.

(viii) Road Maintenance, Rehabilitation and Regravelling 1/

- schedule of formation of gangs and work programs;
- deployment, manning and equipping of gangs;
- work in progress and completed;
- operational status of equipment and equipment utilization.

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1/ Proposed detailed formats for project monitoring and reporting requirements are available in the Project File (Annex 5, C-4).

- (b) Actual or expected deviations from the project implementation schedule;
  - (c) Actual or expected difficulties or delays and their effects on the implementation schedule, and the steps planned or taken to overcome the difficulties and avoid further delay;
  - (d) expected changes in the completion date of the project;
  - (e) key personnel changes in the staffs of the Roads Division, consultants, or contractors;
  - (f) matters which may affect the cost of the project; and
  - (g) any development activity likely to affect the economic viability of project components.
- II. A bar-type progress chart, based on the project implementation schedule, should show the progress in each project component.
- III. A financial statement should be set out in tabular form and indicate for each project component:
- (a) original estimated cost;
  - (b) revised cost, if appropriate;
  - (c) actual expenditure;
  - (d) projected expenditure; and
  - (e) actual and projected withdrawals from the Credit Account.
- IV. Finally, the Report should state the status of action of each covenant of the Credit Agreement.

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Related Documents and Data Available in Project File

A. Reports and Studies on the Sector or Subsector

- A 1 - R. Hofmeier, "Transport and Economic Development in Tanzania with Particular Reference to Roads and Road Transport", 1973.
- A 2 - Japan International Cooperation Agency, "Southern Coastal Link Road, Feasibility Study and Preliminary Design", 1977.
- A 3 - Brokonsult AB, "A Feasibility Study of the Development Potential and Feeder Road Improvements in the Tabora Region", 1975.
- A 4 - Scandiaconsult, "Feasibility Study, Kilombero Area", 1977.
- A 5 - Cowinconsult and the Economist Intelligence Unit Ltd., "Feasibility Study, Kilimanjaro Area", 1976.
- A 6 - Howard Humphreys & Sons, "Design Review of Songea-Makambako Road", 1978.
- A 7 - The Crown Agents, "Road Maintenance Equipment and Depot Servicing Facilities in the Southern Regions of Tanzania", 1977.
- A 8 - Finnconsult, "Mtwara Regional Integrated Development Plan 1975-1980", 1975.
- A 9 - Trimac Consulting Services Ltd., "Tanzania Trucking Industry Study", 1976.
- A 10 - World Bank Group, "Tanzania - Transport Sector Memorandum", 1977.

B. Reports and Studies Relating to the Project

- B 1 - Japan International Cooperation Agency, "Vehicle Operating Costs on Southern Coastal Link Road Project", 1976.
- B 2 - Lyon Associates Inc., "Economic and Engineering Study, Tanzania Highway Maintenance and Organization", 1972.

- B 3 - McKinsey & Co., "Making Comworks More Manageable", 1973.
- B 4 - Coopers & Lybrand Associates Ltd., "Tanzania Tourism Study", 1978.
- B 5 - World ORT (Geneva), "Proposed Highway Maintenance Program, Areas II and III", 1978.
- B 6 - World ORT (Geneva), "Technical Assistance & Training for Highway Maintenance" (draft final report), 1976.
- B 7 - Comworks, "Proposals for Tanzania Trunk and Territorial Road Maintenance", 1973.
- B 8 - Ministry of Finance and Planning, Tanzania, "Third Five-Year Plan for Infrastructure and Social Services (July 1976-June 1981)", 1978.

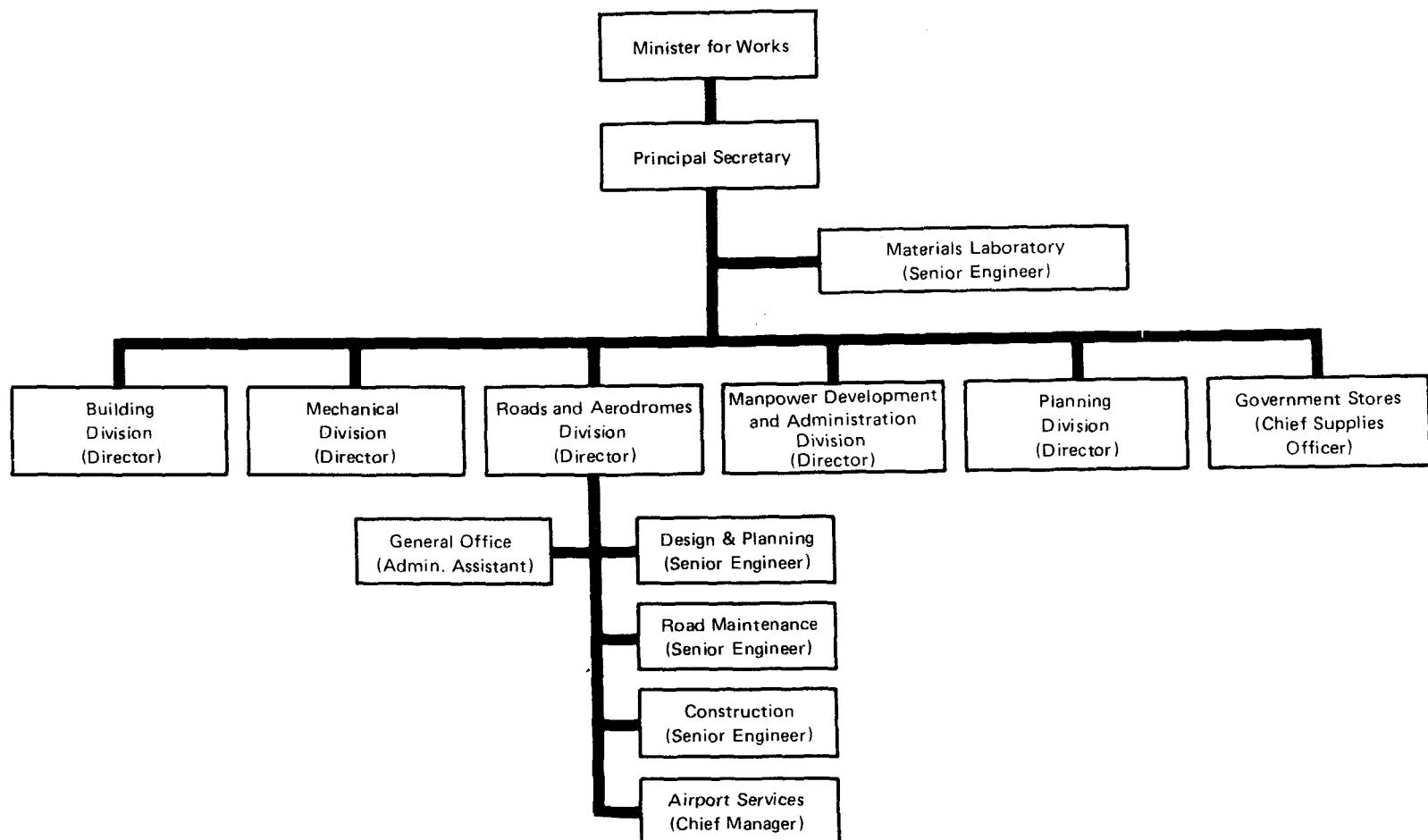
C. Selected Working Papers, Tables, Drawings and Maps Prepared by Bank Staff or its Consultants

- C 1 - Calculation of Economic Benefit/Cost Tables.
- C 2 - Calculations of Project Cost Elements and Contingencies.
- C 3 - Terms of Reference for Technical Assistance.
- C 4 - Detailed Formats for Project Monitoring and Reporting Requirements.
- C 5 - Traffic Count Data 1972 - 1977 and Traffic Count Station Map, 1978.

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**Organization Chart – Ministry of Works**



Source: MOW, November 1978

World Bank – 19349

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CHART 2

Implementation Schedule

