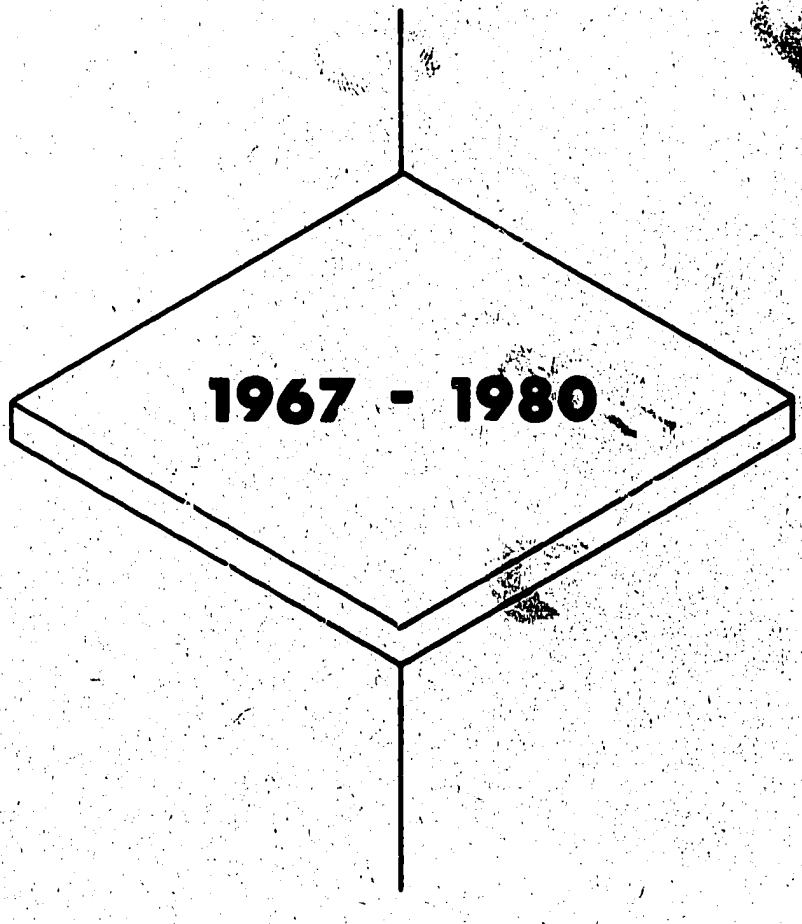
SOME EFFECTS OF POPULATION GROWTH

IN JORDAN



USAID/J

EFFECTS OF POPULATION GROWTH IN JORDAN 1967-1980

PREFACE

Rapid population growth is one of the most urgent of problems facing developing countries as they strive to improve the economic and social well-being of their citizens. Worldwide attention has been drawn to the press of population vis-a-vis available food. Less attention has been focused on the equally significant effects of high population growth rates upon a nation's material and cultural resources. Economic analysis conducted in a number of less developed countries has shown that very often a marked absolute improvement in economic and social sectors has been more than absorbed by population growth, with the result that on a per capita basis the country has made little or no progress.

USAID/Jordan has prepared this study to highlight some of the effects which Jordan's present population growth rate will have on selected economic and social areas over the next twelve years. We believe that it is important to bring this information to the attention of leading citizens in Jordan because the data clearly show that unplanned population growth will have serious economic consequences in the near future.

This study was not prepared by experts in demography or statistics. The statistics relating to patterns of population growth are taken from "Analysis of Population Statistics On Jordan - Vol. I" - Department of Statistics. Other data are taken from "Jordan Seven Year Plan - 1964-1970". Some are informed estimates based upon data at hand from various sources. Geographical data are based upon the Armistice Line of 1949. The data do not reflect changes which may have occured due to the June, 1967 war.

ESTIMATED POPULATION GROWTH

Jordan's population in 1967 is estimated at 2,100,000. Assuming fertility constant and mortality gradually declining, (life expectancy at birth moving from 52 in 1961 to 62 in 1981) Jordan's population in 1980 will be almost 3,300,000, as shown on Chart I.

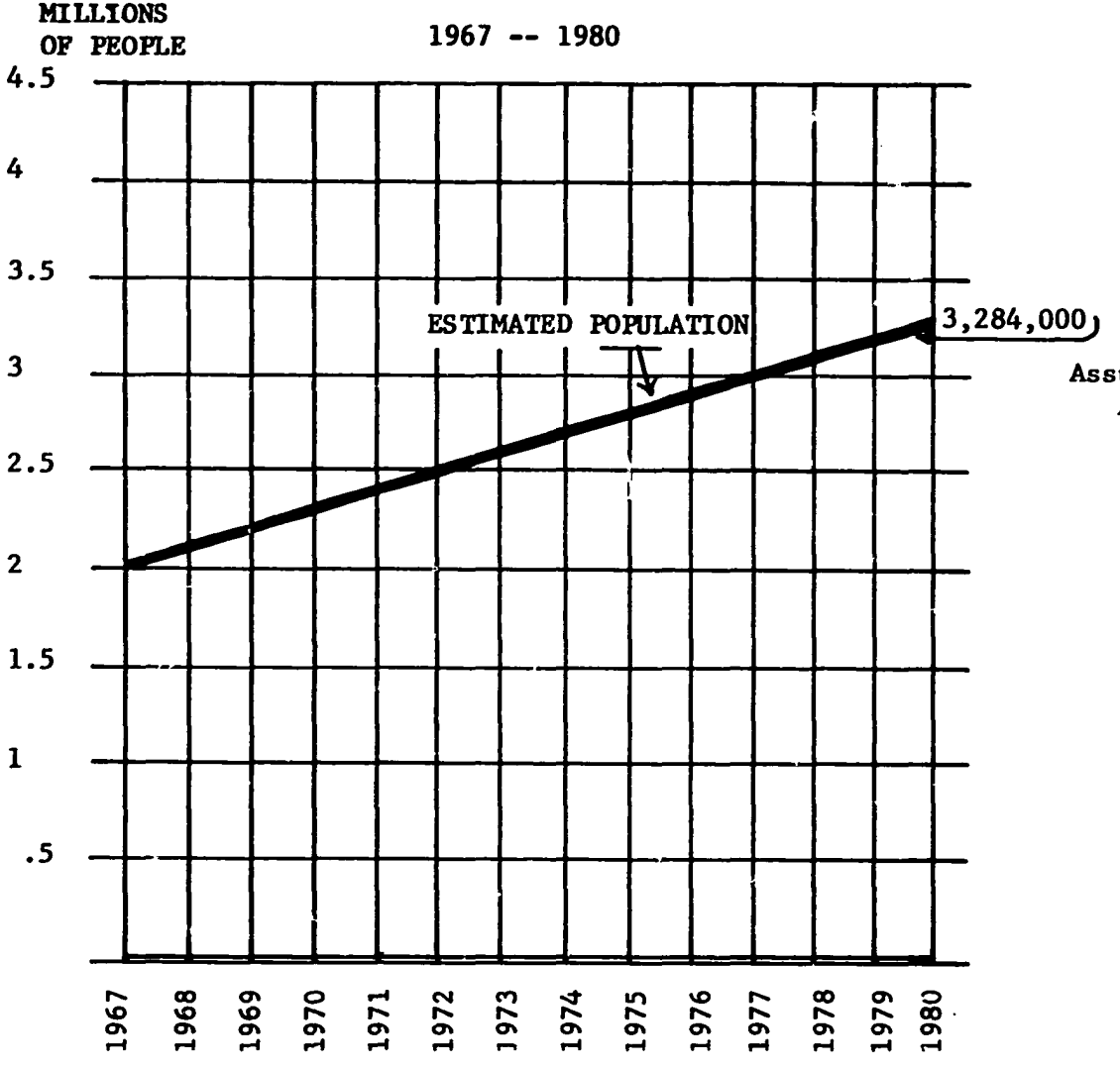
Jordan's present population is young. Forty-six percent of the total population today is under 15 years of age. The distribution of young people in the population will continue to increase over the period under consideration to over forty-eight percent in 1980. The death rate, even without improved health and medical care, would decline because of this. Therefore, given no change in the birth rate, the population growth rate will continue to rise. Chart I is based upon an assumed 1967 growth rate of 3.3 percent, with an annual average growth rate of 3.5 over the twelve year period. In 1980, the growth rate will be 3.7 percent.

These statistics would indicate that even with modest family planning, a slowly reducing birth rate will probably not keep pace with the declining death rate, and that the growth rate would continue to move upward from 3.3 percent.

CHART I

ESTIMATED POPULATION GROWTH
FOR JORDAN

1967 -- 1980



ESTIMATED POPULATION GROWTH FOR JORDAN

(Armistice Line of April, 1949)

Assumptions: 1967 Population = 2,100,000
Average Annual Growth Rate = 3.5 %

Year	Estimated Population
1967	2,100,000
1970	2,328,000
1975	2,765,000
1980	3,284,000

EFFECT ON GENERAL ECONOMIC DEVELOPMENT AND PER CAPITA GNP

This population growth over the next twelve years, i.e. 1,200,000 new people or an average annual growth rate of 3.5%, must be provided for from Jordan's resources before any new investment results in increased development. If Jordan is increasing its gross national product by 7%* per year but its population is growing at an average of 3.5% per year, then per capita GNP rises only at a rate of a little under 3.5% per year. This means that per capita GNP, now estimated at 94 JD($263) will not increase to 180 JD($500), which is double its present amount, until about 1988. In 1980 it will have increased only to 144 JD($404).

The per capita income which is thought to permit an adequate standard of living varies among nations depending upon custom, habits, and price levels. However, it is a reasonable assumption that a per capita income of 180 JD($500) per year is a minimum standard for Jordan based upon present price levels.

Thus, a very excellent economic performance (7% annual increase in GNP) would result in 1980 in 57% more people living in sub-standard conditions, with productive capacity having increased minimally.

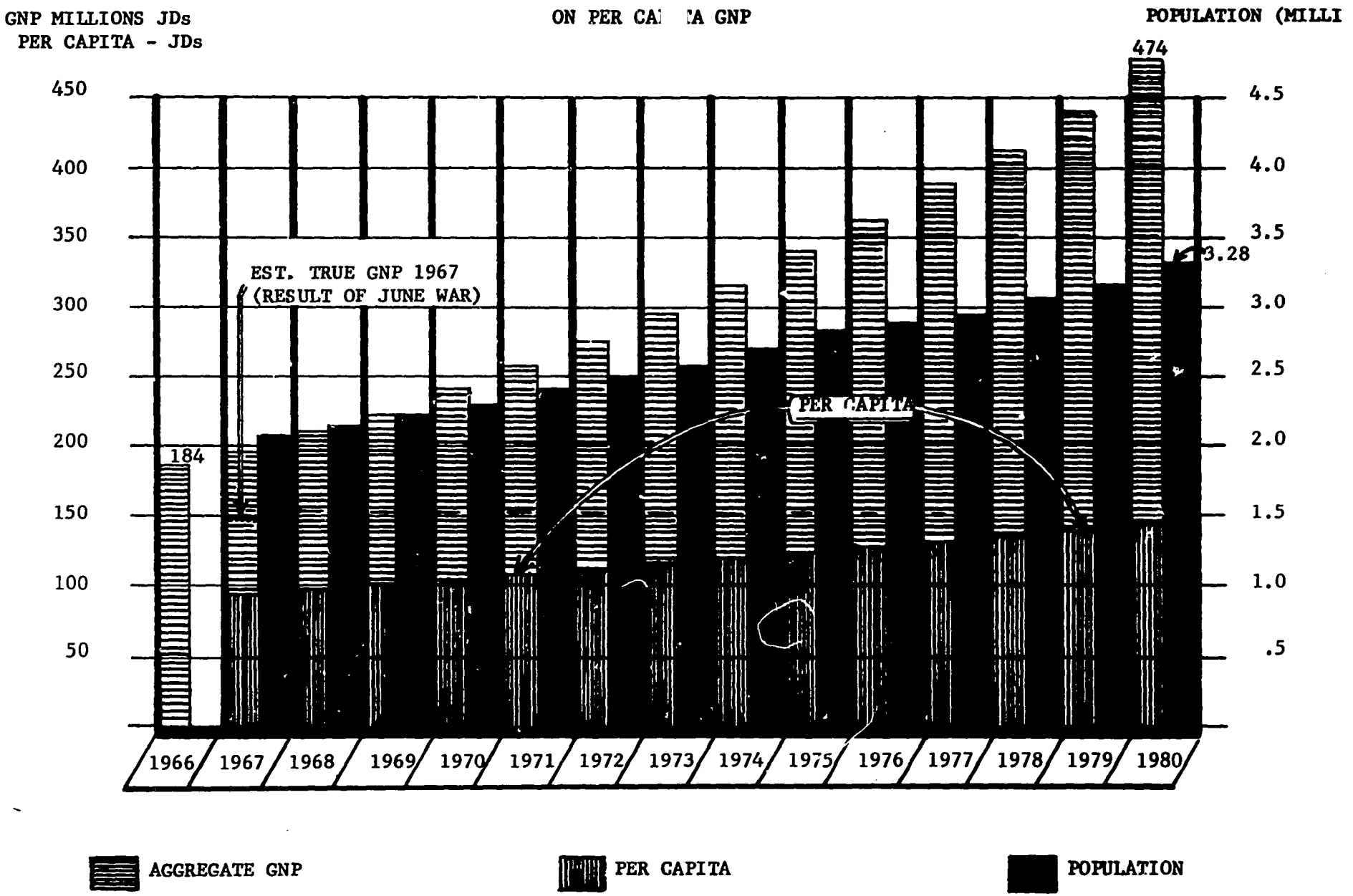
Chart II demonstrates graphically these relationships.

* Jordan Seven Year Plan 1964-1970

C

EFFECTS OF [illegible]ION GROWTH

ON PER CA[illegible]A GNP



EFFECT ON AGRICULTURAL IMPORTS AND FOOD CONSUMPTION

Agriculture is the most important segment of Jordan's economy. More than 40 percent of the labor force is in agriculture, 23 percent of the GNP is generated in the agricultural sector and agricultural products account for approximately 1/3 of Jordan's exports.

Using 1966 statistics, Jordan imported roughly JD 18,000,000 ($50,760,00 equivalent) worth of essential food commodities, which is 26% of Jordan's total imports. This is the largest single drain on foreign exchange and the total economy.

Jordan has made impressive gains in increasing the production of fruits and vegetables and with proper emphasis such increases likely can be sustained. Jordan has been less successful in increasing wheat yields but with the wheat improvement programs now underway, it is unlikely that Jordan will have to import more wheat than at the present time and possibly not as much.

Favorable increases are also being made in the production of poultry meat and eggs and for the purposes of this study, no increased imports of these products (poultry and eggs) is projected but due to increased population, sizeable imports are expected to continue.

It is unlikely that any substantive increases will be made in the production of meat from cattle, sheep, goats or fish. Rice imports are expected to increase at about the same rate as the population. Similar increases in imports are foreseen for sugar, corn (maize), and sesame. Sizeable production increases are forecast for olives and olive oil but will likely be unable to more than keep pace with population growth and the importation of fats and oils is expected to continue at or near present levels. The following table is indicative of the kind of increases forecast for 1980:

	1966 JD	1980 JD
Live animals, sheep, goats and meat	1,419,748	6,009,748
Milk	811,698	1,891,698
Rice	1,467,729	2,331,729
Sugar	1,962,686	2,712,686

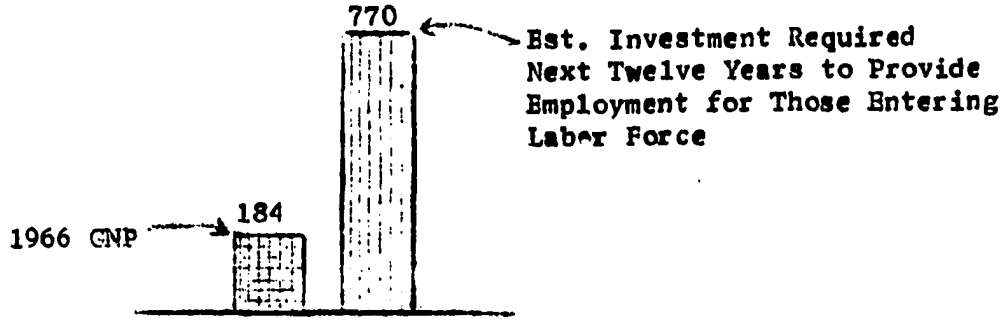
In summary, the annual cost of food imports is expected to increase from approximately JD 18,000,000 to JD 27,000,000 even if the wheat improvement program is successful. It must be made to succeed or the total is expected to exceed JD 34,000,000 or nearly double the 1966 cost of agricultural imports. The foregoing projections are based on the assumption that there will be no increase in the per capita consumption of these commodities.

EFFECT OF THE LABOR FORCE AND EMPLOYMENT

Jordan's labor force in 1967, consisting of all persons working or actively seeking work, is estimated at 475,000. This is 42% of all persons in the population 15 years of age and over. Unemployment is estimated at 12 to 14 percent but this figure is probably too low.

Jordan's labor force in 1980 is estimated at 800,000 or 47% of the population 15 years of age and over. This means that over the next twelve years 325,000 new jobs will have to be created if unemployment is not to increase materially.

On the assumption that the number of workers productively engaged in agriculture will not increase much above the 1967 level (over forty percent of the labor force), these 325,000 new jobs must be created in the non-agricultural sectors of the economy. It seems reasonable to assume a minimum investment cost of 2000 JDs for each job created. This will require an aggregate of 770,000,000 JDs invested in the non-agricultural sectors of the economy over the next twelve years, which amounts to over four times the 1966 GNP.



EFFECT ON EDUCATION

The predicted 1,200,000 increase in population over the next 12 years includes 436,000 school age children (5-14).

These 436,000 will require 12,457 teachers and classrooms. This could be visualized by saying 622 schools of 20 classrooms each. Current average costs for building and equipping classrooms is 2000 JDs each or a total of 24,914,000 JDs ($70,506,620).

The operating cost of expanding enrollment by one student is estimated at an average of about 15 JDs. The 436000 additional students will require an additional 6,540,000 JDs in operating costs.

Chart III shows the projected enrollment in Ministry of Education schools for all grades. The assumptions on which Chart III is based are:

74% of the under one year age group are enrolled in M.O.E. schools at age six.

Those enrolled remain in school through grade 6.

There is an 8% drop out between grades 6 and 7.

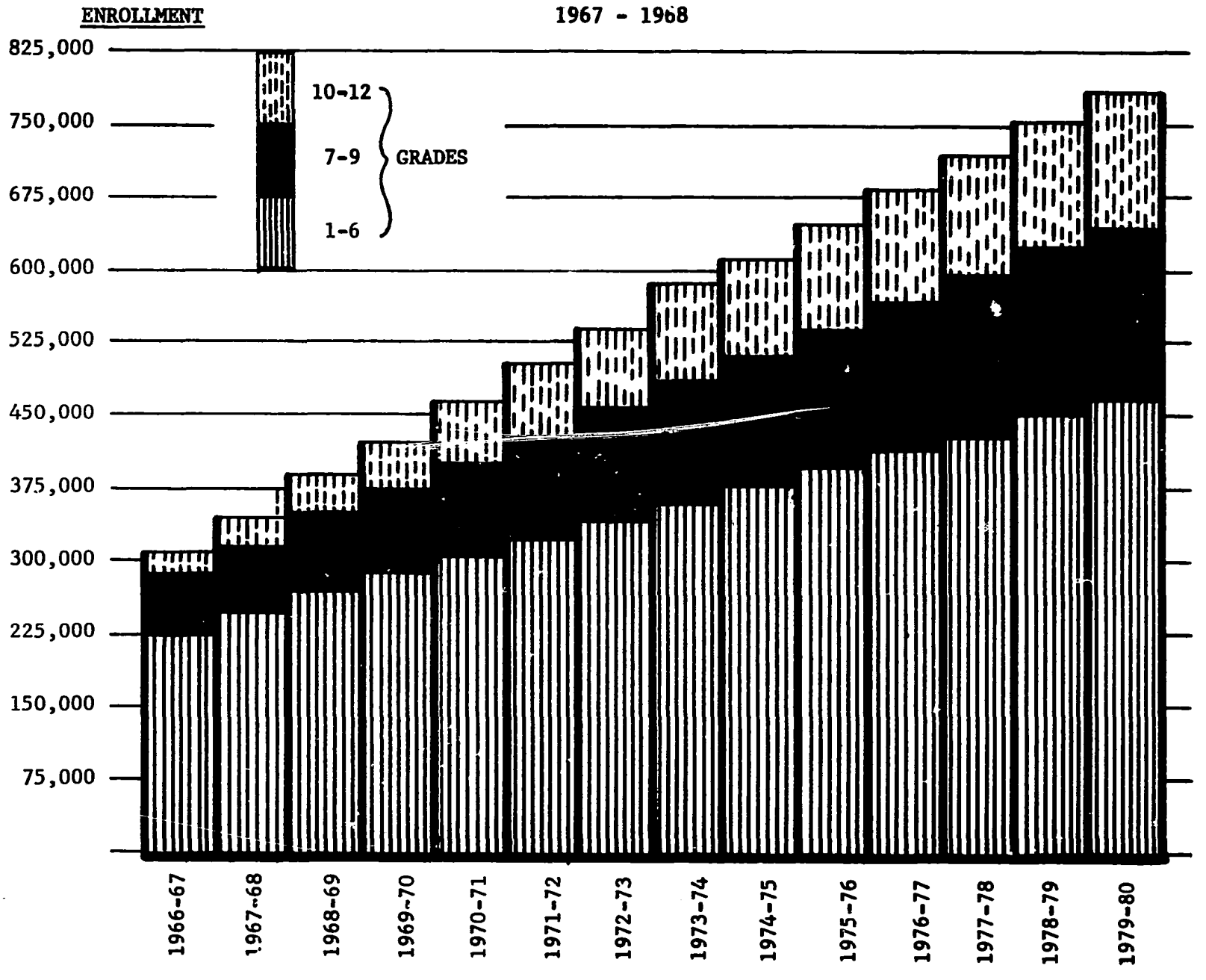
There is an 8% drop out between grades 9 and 10.

By 1979-80, 96.4% of all the six to eleven age group are in school and 85% of those are in M.O.E. schools. Of the twelve to fourteen age group, 80% are in school and 83% of those are in M.O.E. schools. Of the fifteen to seventeen age group, 66% are in school and 75% of those are in M.O.E. schools.

CHART III

PROJECTED ENROLLMENT IN MINISTRY OF EDUCATION SCHOOLS

1967 - 1968



EFFECT ON DOMESTIC AND INDUSTRIAL WATER CONSUMPTION

Chart IV shows the effect of population growth on water consumption in Jordan. The curve presents the effect of population growth only, without taking any account of increased standard of living, improvements in and expansion of service areas. Average per capita consumption remains constant at 13 cubic meters per year. The chart indicates an increased demand for nearly 15,000,000 cubic meters of water in the year 1980 over consumption in 1967.

The chart is based upon the following assumptions:

(a) Improvements and expansion of service areas now planned and underway will be completed by 1970--at which time 80% of the total population will receive pipe water.

(b) Piped service to 80% of the population remains constant.

(c) Consumption rate in Amman, Zerka, Jerusalem, Ramallah and Aqaba remains constant at 25M^3/capita/year.

(d) Consumption rate for Nablus, Bethlehem, Hebron, Kerak and Ma'an remain constant at 15M^3/capita/year.

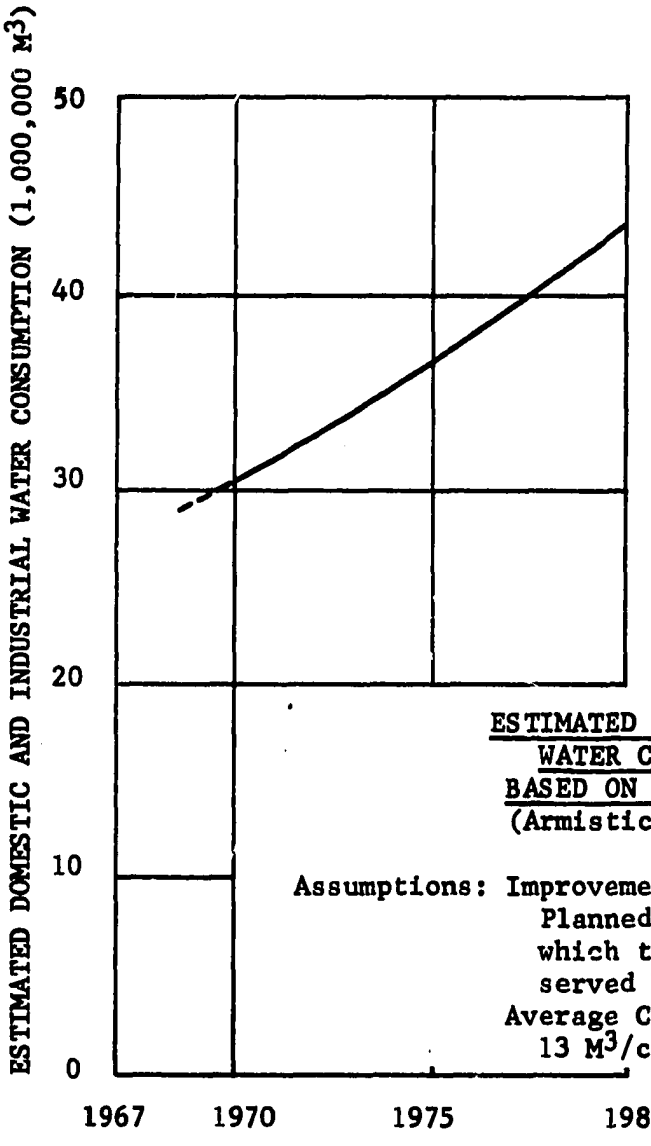
(e) Consumption rate for the Azrak Northern District remains constant at 10M^3/capita/year.

(f) Consumption rate for the balance of the system remains constant at 8M^3/capita/year.

(g) Consumption rate for the balance of the system remains constant at $8M^3$/capita/year (Desert wells).

(h) Average consumption from 1970 remains constant at $13M^3$/capita/year.

CHART IV



Estimated Annual
Domestic and Industrial Consumption

ESTIMATED DOMESTIC AND INDUSTRIAL WATER CONSUMPTION FOR JORDAN BASED ON POPULATION GROWTH ONLY
(Armistice Line of April, 1949)

Assumptions: Improvements and Expansion Now Underway or Planned Will be completed by 1970, at which time 80% of Population will served by piped systems.
Average Consumption remains constant at 13 M^3/capita/year

Year	Population	Domestic & Industrial Water Consumption (M^3)
1970	2,328,000	30,200,000
1975	2,765,000	35,950,000
1980	3,284,000	42,700,000

EFFECTS ON ELECTRICAL ENERGY GENERATION AND PEAK DEMAND

Chart V presents the effects of population growth on electrical energy generation and peak demand for the years 1967 - 1980.

In addition to the totals for both Peak Demand and Energy, projections for each of three areas are shown: East Bank-North, East Bank-South, and West Bank.

These curves assume no increase in the standard of living, no increase in service areas, no betterment in the reliability of service, etc. In other words, only the effect of population increase is considered. The basic figure for electrical energy generation of 1966 is considered to be quite reliable. The load factor (for computing peak demand) is assumed to be 50% -- a quite realistic factor.

Year	Population	Generation (kwh)	Peak Demand (kw)
1966	--	203,800,000	--
1967	2,100,000	211,000,000	48,170
1970	2,328,000	233,900,000	53,400
1975	2,765,000	277,800,000	63,400
1980	3,284,000	329,900,000	75,300

It is well to point out that many other factors than population growth will affect electrical energy demand. For example if the North Jordan central generation station and transmission grid project went ahead this area alone could require

generation of up to 767,500,000 kwh annually with a peak demand of 175,200 kw.

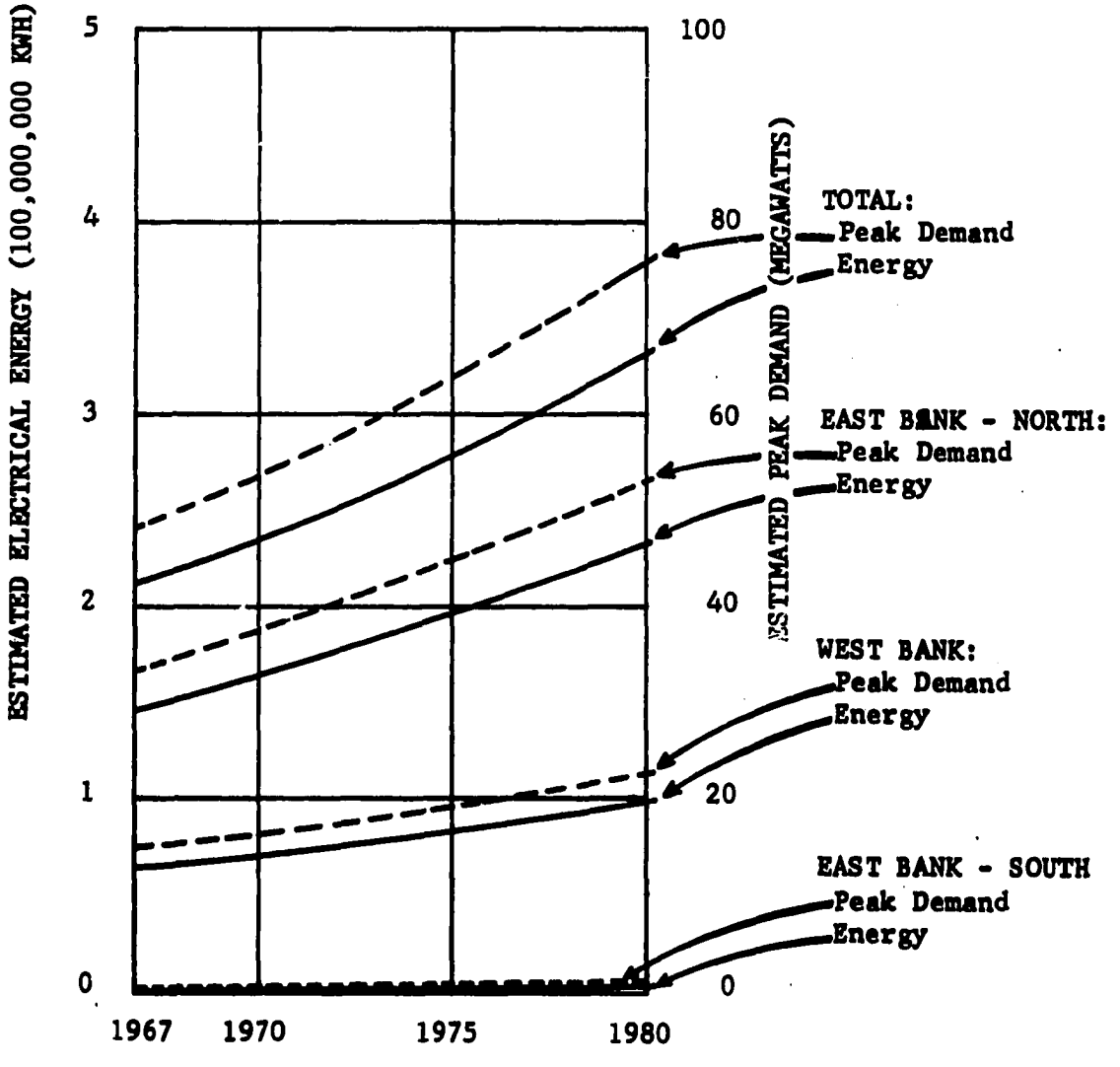
The minimum estimated cost at present day prices of installing facilities to meet indicated load growth is:

Period	Cost
1967-70	JD 470,000
1970-75	JD 900,000
1975-80	JD 1,070,000
Total	JD 2,440,000

CHART V

ESTIMATED ELECTRICAL ENERGY GENERATION AND
PEAK DEMAND FOR JORDAN
BASED ON POPULATION GROWTH ONLY
(Armistice Line of April, 1949)

Assumptions: 1967 Electrical Energy Generation Total - 211,000,000 Kwh
1967 Peak demand = 48,170 KW = 48.17 MW
Load Factor = 50%
Generation - Sales Plus System Losses
Only Population Growth Considered, i.e. Energy Generation
Per Capita Remains Constant = 100.462 Kwh/Capita



EFFECTS ON THE HIGHWAY SYSTEM

The curve on Chart VI projects daily vehicular traffic for selected major highways in Jordan as illustrative of the construction requirements which lie ahead. Only the effect of population growth is considered. No account is taken of increased standard of living, higher per capital rates of imports and exports, etc.

Following is a summary of indicated improvements up to the year 1985. Only for the first six highways were increases in traffic computed, the balances are "educated guesses".

Amman-Zerka: 4 lane highway required now.

Amman-Jerusalem: 4 lane highway required 1985.

East Ghor Highway: Nothing beyond present project.

Desert Highway: Nothing beyond planned relocations at Southern end.

Bagdad Highway: Nothing

Ramtha-Mafraq: Widen to 7.5 meters about 1985.

Amman-South to Madaba and Desert Highway Junction: 4 lane highway about 1985.

Jerusalem-Ramallah: Mostly 4 lane now--completion required now.

Amman-Sweileh: 4 lane highway about 1985

Below is our estimate of costs (based on present day prices) of the highway improvements indicated.

(a) Amman-Zerka, 4-lane highway

Year	Estimated Expenditures JD
1968	110,000
1969	330,000
1970	330,000
1971	330,000
	JD 1,100,000

(b) Jerusalem-Ramallah, complete 4-lane highway

Year	Estimated Expenditures JD
1968	150,000
1969	150,000
	JD 300,000

(c) Wadi Yutum Relocation

Year	Estimated Expenditures JD
1969	300,000
1970	300,000
	JD 600,000

(d) Amman-Jerusalem, 4-lane highway

Year	Estimated Expenditures JD
1976	150,000
1977	300,000
1978	650,000
1979	650,000
1980	650,000
1981	650,000
1982	650,000
	JD 3,700,000

(e) Amman-Desert Highway Junction, 4-lane highway

Year	Estimated Expenditures JD
1983	50,000
1984	300,000
1985	250,000
	JD 600,000

(f) Ramtha-Mafraq, widen

Year	Estimated Expenditures JD
1984	200,000
1985	200,000
	JD 400,000

(g) Amman-Sweileh, 4-lane highway

Year	Estimated Expenditures JD
1983	75,000
1984	200,000
1985	200,000
	JD 475,000

Summary of expenditure by years

Year	Estimated Expenditures JD
1968	260,000
1969	780,000
1970	630,000
1971	330,000
1976	150,000
1977	300,000
1978	650,000
1979	650,000
1980	650,000
1981	650,000
1982	650,000
1983	125,000
1984	700,000
1985	650,000
	JD 7,175,000

Summary of Expenditure by project:

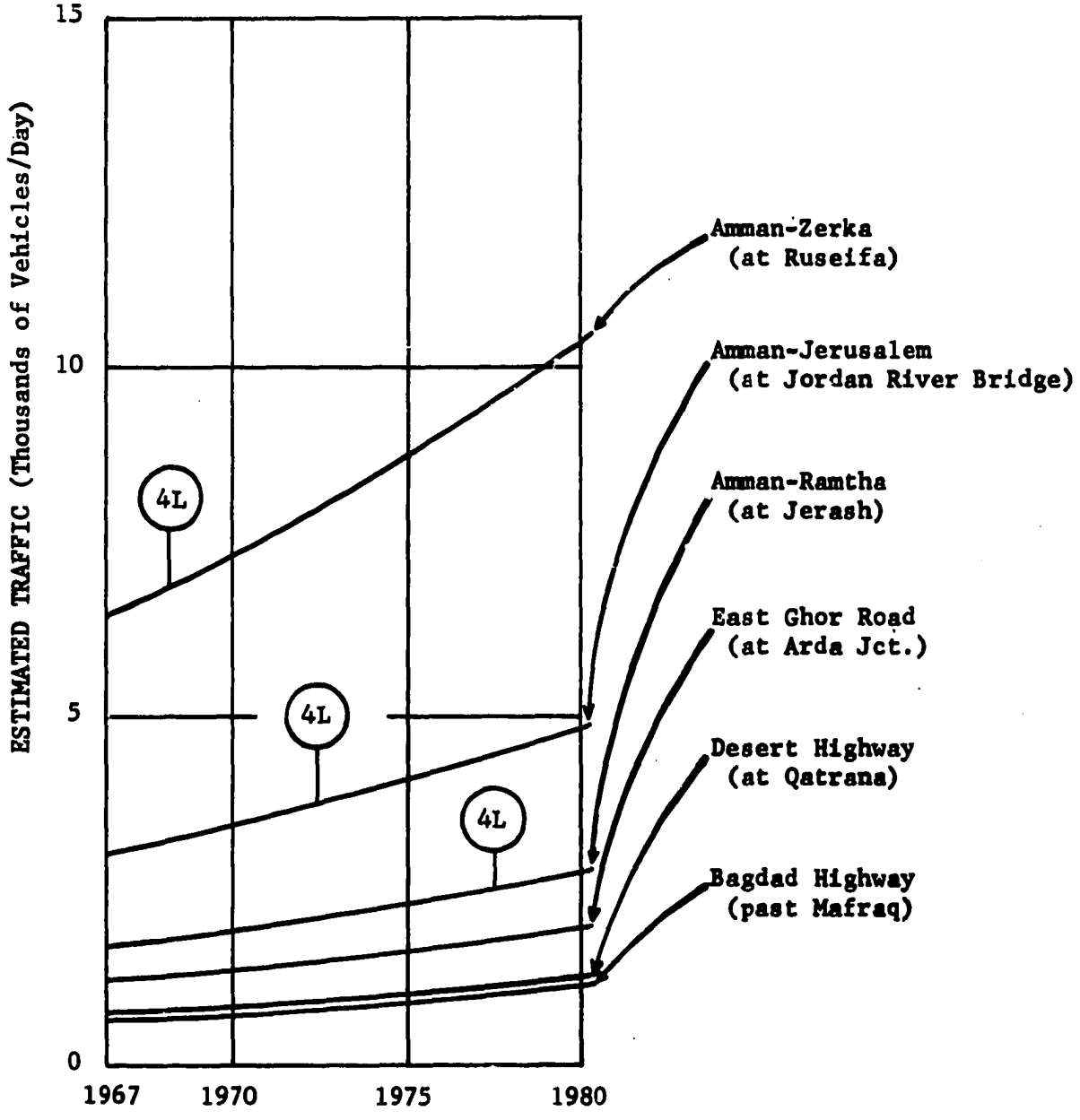
Project	Estimated Expenditures JD
Amman-Zerqa	1,100,000
Jerusalem-Ramallah	300,000
Wadi Yutum	600,000
Amman-Jerusalem	3,700,000
Amman-Desert Highway Junction	600,000
Ramtha-Mafraq	400,000
Amman-Sweileh	475,000
	JD 7,175,000

In addition to the above improvements for the present highway system, there are plans for a new highway linking Amman direct with Kuwait (via Azraq) as part of the Pan-Arabian Highway System. Work is anticipated to start within the near future. Our estimated cost for this project, including studies, engineering right-of-way and construction, is JD 2,000,000 to JD 2,500,000.

CHART VI

TYPICAL MAJOR HIGHWAY IMPROVEMENTS REQUIRED FOR JORDAN BASED ON POPULATION GROWTH ONLY

Assumptions: Selected Highways now Two-Lane, 7.5 meters wide except Bagdad Road which is 5.5 meters wide.
Four Lane Divided Highway justified when Traffic Count reaches 5,400 Vehicles/day
7.5 meters width justified when Traffic Count Reaches 3,200 Vehicles/day



ESTIMATED PETROLEUM REQUIREMENTS FOR JORDAN BASED UPON POPULATION GROWTH ONLY

Chart VII presents curves projecting petroleum products requirements through 1980 based only on the effect of increased population. Increased standards of living and other factors are not accounted for.

The production estimates for 1967 are considered to be quite accurate as they were obtained from the Jordan Petroleum Refinery staff based on actual production for 1966.

Year	Population	Total Requirements
1967	2,100,000	474,000 M Tons
1970	2,328,000	525,500 M Tons
1975	2,765,000	624,200 M Tons
1980	3,284,000	741,300 M Tons

The estimated installed cost (at present day prices) of facilities to meet indicated demands is:

Year	Cost
1968	JD 3,000,000 (newly contracted)
1980-1985	JD 3,000,000
Total	JD 6,000,000

CHART VII

ESTIMATED PETROLEUM REQUIREMENTS FOR JORDAN (NOT INCLUDING AVIATION GASOLINE AND JET FUEL) BASED ON POPULATION GROWTH ONLY (Armistice Line of April, 1949

Assumptions:

Requirements for 1967 as estimated by Refinery Staff:

Crude for Cement Plant	10,000 M Tons
Buda Gas	10,000 M Tons
Gasoline (Auto)	80,000 M Tons
Kerosene	75,000 M Tons
Deisel Fuel	144,000 M Tons
Fuel Oil	98,000 M Tons
Asphalt	34,000 M Tons
Refinery Use	23,000 M Tons
Total	474,000 M Tons