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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT
INTERNATIONAL DEVELOPMENT ASSOCIATION

CURRENT ECONOMIC POSITION

AND PROSPECTS

OF KOREA

(in four volumes)

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2

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This Report is based on the findings of a Mission which visited Korea in September 1967. The Mission was composed of the following members:

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Transportation

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LIST OF ABBREVIATIONS

1. Agencies of the Korean Government

EPB	Economic Planning Board
MOT	Ministry of Transportation
MOC	Ministry of Construction
MCI	Ministry of Commerce and Industry
MOF	Ministry of Finance
MAF	Ministry of Agriculture and Forestry
KNR	Korean National Railroad
KAL	Korean Airlines
BOK	Bank of Korea

2. Planning Documents

FFYP	First Five-Year Plan
SFYP	Second Five-Year Plan
ORB	Overall Resources Budget
KTS	Korea Transportation Survey

I. GENERAL FINDINGS AND RECOMMENDATIONS

A. Introduction

1. An integrated transportation survey was carried out in Korea from November 1965 to June 1966. It included the entire country and all modes of transport. Its primary function was to recommend a detailed transportation investment program for the Second Five-Year Plan 1967-1971 (SFYP). According to the objectives established for the progress of the economy during the SFYP by Korea's central planning agency, the Economic Planning Board (EPB), the survey was based on the assumption of a GNP growth rate of 7%. The investment program recommended by the Korea Transportation Mission has been partly adopted by the Government.

2. In fact, the economy developed in 1966 and 1967 much more rapidly than had been expected. A reassessment of the development of transport during the SFYP has become necessary. The primary function of this report is to review the traffic forecasts, the recommendations and the suggested investment program made in the Korea Transportation Survey (KTS) report.^{1/} This report is based on the assumption of a GNP growth rate of 10.5% in 1967 and 10% in the last three years of the SFYP. The assumption of a 10% GNP growth rate conforms to the present expectations of Korea's planners. An assessment of the feasibility of this rate is given in Volume I of this report.

3. One of the most striking features of land transport in Korea is the disproportion between the roles played by the railroads and the highway transport system. At the end of 1966 the Korean National Railroad network comprised more than 3,000 km of roads, but there existed only 1,900 km of paved public roads (including city streets). The total inventory of motor vehicles amounted to only 50,000, i.e. one vehicle per 600 inhabitants. In the development phase which Korea has now entered, special attention should be given to road transport so as to achieve a balanced utilization of both types of transportation considered as mutually complementary. This was one of the main conclusions of the KTS. The subsequent acceleration of economic growth has further accentuated the need for increased development of road transport.

4. Another feature is a generally insufficient capacity in the transportation sector resulting in the overcrowding of all types of inland transportation. The very high rate of economic growth in Korea in recent years has led to bottlenecks in transportation. At least one example may be found in the lack of transportation facilities for limestone transportation for use in agriculture. Complaints by the

^{1/} Although it has been attempted to make this report self-sufficient, consultation of the KTS report may be useful.

business community about delays in shipping are general and appear founded in fact. The Mission was, however, not equipped to survey methodically the delay in the transportation of goods.

5. The fact that the share of the transportation sector in the national economy is still insufficient is also reflected by i) the low percentage of the value added of transportation in relation to GNP, and ii) the low percentage of the capital formation of transportation in relation to the total domestic fixed capital formation (Table 2).

6. Value added: The transportation share in GNP formation, although increasing steadily during the FFYP, was only 3.3% in 1966. This percentage generally ranges between 6% and 9% in other countries^{1/}, and although there is wide variation between countries due to different geographical dispersion of economic activity, a value under 5% almost always indicates underdevelopment in the transportation sector. The dispersion of activity factor not being particularly favorable in Korea, there is no doubt that the present relative contribution to GNP is below the optimum. Between 1961 and 1966 the value added of transportation, at 1965 constant prices, increased at an average rate of 15.3% per annum, which is comparable to the traffic increase rate.^{2/} The situation, however, was quite different for railroad and highway transportation. The value added of the former increased at an average rate of only 8.7% per annum, i.e. less than the related traffic increase which was about 11%. The value added of the latter increased by 22.1% per annum, which is more than the related traffic increase, taking into account the slow development of freight transportation.

7. This divergence is probably in part due to relative inflexibility of rates rather than to a change in the economic contribution of these transport modes. As far as railroads are concerned, an explanation can be partly found in the fact that, at constant prices, the fares decreased during the FFYP. But the low tariff level cannot account for the low percentage of value added of transportation, as the railroad tariffs^{3/} allowed quite similar profits in each year of the considered period.^{3/} The reason is to be found in the small traffic volume in relation to the requirements of the economic development of the country.

1/ The percentage tends to increase with per capita income. See H.B. Chenery, "Patterns of Industrial Growth", American Economic Review, September 1960.

2/ When adding the city passenger traffic to the intercity passenger traffic (Table 1), total passenger traffic figures are 9.94 and 21.12 billion pass-km in 1961 and 1966 respectively. Yearly increase rate is 16.3%. It is 13% for goods (Table 1), 18% for harbor traffic.

3/ KNR lost money on freight, but the loss was made up for by profit on passengers.

8. Capital formation: On an average, the share of capital formation in the transportation sector^{1/} in relation to total capital formation in the country was 16.64% during the FFYP, while a level between 20 and 25%, in developed as well as in developing countries, is more appropriate.^{2/} This shows that past investments were insufficient to remove the existing bottlenecks.

B. The Outlook for Traffic

9. The Mission's forecast with regard to the development of traffic during the remaining years of the SFYP is shown in Table 1.

10. (a) Passengers: Traffic increased at an average rate of 14.1% per annum during the First Five-Year Plan (FFYP), which denotes an elasticity of 1.7 in relation to GNP. Owing to a faster increase in motor vehicle traffic, the share of the railroads in total passenger transportation dropped from 66% in 1961 to 55% in 1966. The same trends are likely to be observed in the future. Since it is normal for the elasticity of passenger traffic in relation to GNP to drop in the course of economic development, traffic may be expected to increase during the rest of the SFYP at the average rate of 15% per annum. The share of the railroads will drop to about 45% of total traffic in 1971.

1/ In this analysis, figures are drawn from the BOK National accounts. They differ from the EPB investment figures and from the investment expenses as provided by the services.

2/ See, for instance, examples provided by Jan Tinbergen in "The Design of Development":

I.	United States (% of national wealth invested in railways, shipping and canals):	1880: 28.5 1890: 26.5 1900: 27.0 1912: 25.1 1922: 22.2 1939: 22 to 23
II.	India Mexico	1951-56: 20 1939-50: 27
III.	Percentage, for 4 to 5 post-war years, of gross investments devoted to railways, shipping, air transportation, motor traffic and communications:	Belgium : 24 Norway : 30 U.K. : 17 Netherlands: 23 France : 19

11. (b) Goods: Traffic increased at an average rate of 12.9% per annum during the FFYP, which denotes an elasticity of 1.55 in relation to GNP. The share of the railroads in total transportation of goods decreased slightly from 83% in 1961 to 80% in 1966, but only in relation to coastal transportation, and more especially of POL coastal transportation. In fact, the increase in the rate of truck transportation was the lowest of all, which must be considered abnormal taking into account the artificially low level of highway freight traffic: reasons are to be found in the poor condition of highways and vehicles, and in the rates, which are much higher for highway than for railroad transportation. Considerable infrastructure development will be necessary to permit a healthy growth rate of trucking and a reduction in the very high cost of road transportation of goods. Another important point is the slow increase of total freight transport between 1965 and 1966: it was only 7.2% while GNP increased by 13.4%. This is a further indication of the bottlenecks which exist in the overall transportation system.

12. Goods traffic may be expected to grow during the SFYP at a high rate of 19% per annum. This tremendous growth is primarily due to the rapidly increasing demand^{1/} for POL transportation. The part played by coastal transportation, not only for POL, but also for coal and cement and other bulk commodities, will be more and more important. We have also assumed that action will be taken by the Government (highway investment, approval of truck import or local assembly) to permit truck transportation to develop at a more rapid pace than the railroads. Under these conditions, the share of the railroads should have decreased to 63% of total transportation by 1971 (compared to 28% for coasters and 9% for trucking).

13. (c) Harbor traffic: Traffic increased at an average rate of 18.2% per annum during the FFYP, and may be expected to increase at a rate of 29% during the SFYP. This acceleration is primarily due to the tremendous increase expected in POL traffic, for crude oil imports as well as for coastal transportation of finished products. It should be pointed out that the increase in harbor traffic will not hit all harbors to the same degree and that the increase in POL traffic will require relatively small investments in port facilities. By the end of the SFYP, coastal traffic in harbors should be equal to sea-going traffic, while POL handling should be equal to dry cargo handling.

14. (d) Air traffic: Growth rates of 20% and 23%, comparable to past trends, may be expected during the SFYP for international and domestic passenger traffic respectively.

^{1/} And to the fact that shifts from land to coastal transportation of POL involve a lengthening of the average transport distance.

C. Tariffs and Financial Results

15. The share of railroads, both in passenger and goods transportation, decreased during the FFYP, to the benefit of highway transportation for passengers and coastal shipping for goods. This difference can be partly explained by differences in the structure of tariffs:

16. (a) Passengers: Bus and railroad fares are at approximately the same level. Basic bus fares are 1.33 won per passenger-kilometer^{1/} while the 1966 KNR average revenue was 1 w/pass-km. In fact, the KNR passenger fares range from 0.81 w/pass-km in third class to 1.62 w/pass-km in second class and 3.20 w/pass-km in first class, with additional charges for certain trains. Only third class is less expensive than bus, while offering less comfortable, and often less frequent and convenient, services. The bus companies and the passenger part of the railways appear to be profitable, although the profit rate is not high. KNR however, in view of rising costs, raised passenger fares by 50% in December 1967, while important changes in the bus fares are unlikely in the near future. Bus transportation will become even more competitive and as a consequence KNR traffic is likely to drop. This probable development was taken into account in the preparation of Table 1.

17. After the last fare increase which occurred in August 1967, the average revenue for air transportation is approximately 12 w/pass-km, about twice as much as the first class sleeping car fares on the Seoul-Pusan run. Operation of domestic lines was regularly losing money in the past. The Mission was unable to judge whether the rate increase is sufficient to provide a reasonable rate of return to Korean Air Lines (KAL); this also depends to an important extent on improvement of the quality of management of KAL.

18. (b) Goods: On an average, trucking rates are much higher than railroad rates; in 1966 the average rate was 1.20 w/tkm for the railroads, 10.5 w/tkm for truck transportation. It must be noted that KNR loses money on freight (at least 30% of related income in 1966) while truck transportation is profitable (10.5% of income in 1966). KNR has raised rates by 30%, while substantial changes in the truck rates are unlikely in the near future. Truck transportation will not become much more competitive until the condition of the highway network is fundamentally improved.

19. Comparison of coastal shipping and railroad rates is difficult as the former vary widely according to the distance, size of vessel, and commodity transported. It may be stated, however, that coastal transportation becomes competitive for bulk transportation when the size of the

1/ The 1966 bus average revenue was 1.50 w/pass-km, inclusive of city transportation.

vessel reaches a certain level. 1/ It does not seem that coastal shipping lost money in the past years. The present rate-setting system, however, needs revision in order to reflect more closely the cost of transportation.

20. It is understandable that, owing to the high truck rates, transport shifts made necessary by the lack of railway capacity primarily affect coastal shipping. In the future, one fundamental aim of Korean transportation policy should be to drastically cut the cost of truck transportation by improving the condition of highways and increasing the capacity of trucks. Improvement of harbors and of loading and unloading facilities, and increases in the size of vessels, could similarly lead to coastal rates for bulk transportation well below the KNR rates.

D. Investments in Transportation During the SFYP

21. In this section an attempt is made to estimate the investment requirements for the transportation sector from the macro-economic point of view. According to the ORB, transportation investments in 1967 and 1968 would amount to won 31.4 and 43.3 billion (Table 3), i.e. won 27.2 and 35.9 billion at 1965 constant prices. When comparing these amounts to total capital formation in the same years, i.e. won 237.3 and 263.3 billion at 1965 constant prices, the share of the transportation sector appears to be 11.5% and 13.6% of the 1967 and 1968 total investments (in 1967 and 1968 respectively). These figures are even lower than the average ratio of transport investment to GNP during the FFYP. 2/ It should also be pointed out that 1967 investment is even lower than investment in 1966. These facts suggest that the planned investments are insufficient although the increase in 1968 over 1967 is substantial.

22. A rough evaluation of the total investments required in the transportation sector during the SFYP may be derived from the considerations dealt with in the Introduction. According to the Mission forecast (see Table 1), total traffic in Korea may be expected to increase at an average rate of 17% or more per annum (15% for intercity passengers, 19% for goods). It is likely that the value added will increase by at least the same rate. 3/ Assuming the capital output ratio to be the same

1/ Between 2,000 and 3,000 DWT (tentative figures) according to a rough calculation made by the Korea Transportation Mission in 1965/66.

2/ It must be noted, however, that the programs of the responsible government agencies in the transportation field suggest that investments would be actually higher (Table 3, note).

3/ The 1968 ORB foresees a growth rate of 17.2% between 1966 and 1967, 16.8% between 1967 and 1968.

as during the FFYP^{1/} total capital formation in transportation during the SFYP should be at least:

$$\underline{(30.15 \times (1.17)^5 - 30.15)7} \times 7.08 = \text{won } 255 \text{ billion}$$

(at 1965 constant prices)

23. One more approach may be used. The revised outlook for 1971 mentioned in the 1968 ORB foresees that total investments during the SFYP period will amount to won 1,430 billion vs. 980 in the original SFYP, i.e. a 45.9% increase. The same coefficient applied to the originally planned investments in transportation, won 150 billion, leads to a revised figure of won 219 billion. If we assume that a 20% share of transportation in total investments is normal, transportation investment during the period should be won 286 billion. As a conclusion, and considering that the investments listed by EPB in the ORB do not include all the investments actually made in the sector (private vehicles, heavy road maintenance equipment, dredgers) won 220 billion may be adopted as a minimum.^{2/} The realization of this program should require, for instance, that investments in transportation, as they are listed in the ORB, increase by 20% each year (at constant prices) from 1968 on, and reach 43, 52 and 62 billion won (at 1965 constant prices) in 1969, 1970 and 1971 respectively. Indications are provided below on what should be the trend in the distribution of investments per mode of transportation in relation with the investments planned for 1967 and 1968.

E. Investments by Mode of Transportation

24. A breakdown of investments by mode of transportation is given in Table 3 for the years 1967 and 1968. The amounts are those used in the preparation of the ORB. Certain adjustments in these figures which the Mission thinks likely are given in the notes to the table. Our appraisal of the magnitude is given in the following paragraphs.

25. Railroads: The investments planned for 1967 and 1968 seem adequate as a whole. Attention is drawn, however, to the KNR under-estimation of future freight transport. This will lead to more investments than planned for the following years in rolling stock, marshalling yards, loading and unloading facilities, signalling and other fixed installations. The output of the rolling stock building workshops should be increased to match the demand to the extent possible.

^{1/} The incremental capital output ratio during the FFYP amounted to 7.08. This figure can be considered normal, or slightly on the low side, when compared with other countries.

^{2/} The Korea Transportation Mission had suggested won 204 billion. This figure included a 10% provision for contingencies, a provision for surveys and supervision, and investments which are not considered as transportation investment by EPB.

26. Highways: It is particularly in this field that investments are insufficient. Only 120 km of highways will be paved in 1968, while the development of traffic would require an annual paving of at least 500 km per year as was proposed in the KTS. The recommendation of the KTS on road paving, although adopted in the SFYP, is apparently not yet being implemented. Only 40 km of national highways will be improved in 1968 which is also extremely low in comparison with requirements. It is feared that accumulated delays in highway investment will do definite damage to the country's economic development in the coming years. This consideration should be kept in mind when planning the investment programs for the coming years.

27. Motor vehicles: The investments planned in the CRB for 1967 and 1968 are insufficient when taking into account the past trend of the fleet expansion as well as the requirements of transportation demand. It is likely, however, that actual investments, which are mostly of a private nature, will be higher than planned. The supply of motor vehicles will increase with the proposed establishment of new assembling plants with a total output capacity of 29,000 vehicles per annum. However it seems likely that unit prices will increase.

28. Harbors: The investments planned for 1967 and 1968 seem adequate as far as harbors are concerned. But the construction of the second dock in In Cheon will require in the coming years much more money than originally contemplated. The Mission has reservations regarding the present plans concerning In Cheon which are discussed in paragraph III. In Pu San, larger investments than envisaged by the Korean authorities may become necessary for harbor extension before the end of the Plan. Investments should be made in all ports to mechanize bulk cargo handling. Amounts proposed for dredging are far too low. The planned program of imports of dredgers may allow an improvement in the situation in the coming years.

29. Shipping: While the planned increase in coastal vessels is fully justified, the proposed investment for sea-going vessels seems far too high. In the opinion of the Mission, the present policy of rapid increase of the sea-going fleet may well be uneconomical, and unfeasible from the manpower point of view, and should be re-examined.

30. Airports: The investments planned for 1967 and 1968 are insufficient to make up for the past shortage and match the traffic increase. Substantial increases in the appropriations are needed in the coming years. The Mission questions the need for a second runway at Kimpo Airport.

31. Aircraft: Increase of the fleet for domestic lines should have high priority. The purchase of a second DC9 for international flights, and the project to buy other long-range jets, seem as unwarranted as the sea-going fleet increase.

F. Recommendations

32. General policy: It is of great importance for policy-makers to realize that in the development phase which Korea has entered, the transportation sector will be a key factor in determining the rate of economic progress. At present there is already insufficient capacity resulting in overcrowding of all modes of transportation. Costs of highway goods transportation are abnormally high. The situation will become worse unless investment is stepped up drastically. Investments in the transportation field have been insufficient in the past and are still deemed insufficient for the years 1967 and 1968. The share of the transportation investments in the overall investments of the nation should be substantially increased in the future. Special emphasis should be given to highway investments, in particular for paving and improving of existing highways, in order to remove the existing bottlenecks and cut transportation costs. In the maintenance field, appropriations are far below requirements for all modes of transport and should be increased.

33. Administration: In order to increase management and operating efficiency, changes should be made in the present legal status and general organization of the agencies responsible for transportation in Korea. Recommendations had been made to that purpose by the Korea Transportation Mission. The Government generally agreed with these recommendations, and projects of reforms have been drafted in certain cases by the Ministries concerned. However, no action has been taken to implement these reforms. It should be understood that the already recommended structural reforms constitute a prerequisite to sound management of the transportation agencies and to the right utilization of the important investments which are to be made in every field during the coming years.

34. KNR is established as a separate administrative entity in the Ministry of Transportation with its own budget and accounting. However, for all important matters the proposals of the KNR General Manager must be approved by the Minister of Transportation, the National Assembly, the Prime Minister or the President. The Management of KNR should be granted greater autonomy and be allowed to use commercial methods, particularly as regards the handling of funds, the organization of personnel and the power to make decisions.

35. Port organization is characterized by a division of responsibility among various authorities. The Ministry of Construction is responsible for harbor construction and maintenance, and dredging; the Ministry of Transportation for harbor operation, construction and maintenance of aids to navigation, and shipping; and the Ministry of Finance for collecting taxes and duties and licensing the stevedoring and lighterage companies. The present financial system does not reflect the actual results of port

management. The absence of unified command deprives the government officials of the stimulus of responsibility and achievement. Marine statistics are of insufficient quality to help to ensure efficient operation and planning. The present organization should be replaced by a Port Authority, responsible for the operation, maintenance and construction of harbors, should be given considerable autonomy, and should utilize an accounting system of the same standard as operated in industrial undertakings.

36. Highway administration is also characterized by a division of responsibility among various authorities. The Ministry of Construction is responsible for construction of national highways; the Ministry of Transportation for highway transportation regulations; the Provincial Governments for maintenance of all highways. In the MOC organization, highway services only consist in a section of the Public Works Bureau, which has neither the authority nor the competence to formulate and implement a true highway policy. There is no coordination of planning and action between Ministries and Provinces, between maintenance and construction, and between the Ministries themselves. All highway matters should be handled by a separate Government Agency for Public Roads, granted with sufficient powers and carrying full responsibility for highway planning, construction and maintenance.

37. The Civil Aviation Bureau is a very small organization within the Ministry of Transportation which has never had the necessary means to properly maintain, operate and develop the network of air facilities. CAB should be allowed to expand and become an administration of a size in accordance with its responsibilities, and with sufficient means to deal with the problems arising from an explosive traffic increase.

38. In general the data-processing system is deficient in every transportation agency. New statistical procedures should be established in each agency, and exchange of information between agencies should be bettered.

39. Coordination problems have not been studied so far in Korea and the economic aspects of the transportation problems have been generally overlooked. All studies involving coordination problems should be carried out by a special office of coordination responsible for all research in the field of transportation and for the formulation of the transportation policy of the Government.

40. Railroads: Traffic is likely to increase at a faster pace than expected by KNR, which will require more investments than originally planned in rolling stock procurement and improvement of station and line capacity. The rolling stock building workshops should be equipped with a view to substituting to a larger extent local construction for imports for passenger coaches and freight cars. Specific surveys, a list of which

is provided below, should be carried out with technical assistance from abroad.

41. Highways: The paving and improving programs should be drastically accelerated. An economic approach, more sophisticated than the system presently used, should be systematically applied to determine the priorities and characteristics of improvements to be carried out.

42. Harbors: The second dock in In Cheon should be constructed as soon as the designs are ready. The Mission is not in a position to give an opinion on the most economic type of closure to adopt. The solution, newly contemplated, of closing the inner harbor, should be carefully re-examined before a final decision is made. Other improvements should also be made in In Cheon harbor. An extension of Pu San harbor may be necessary before the end of the SFYP, and a feasibility and technical survey should be carried out without delay. Improvements in small harbors and in loading and unloading facilities should be studied in relation to the development of coastal traffic with a view to determining the optimum characteristics of coasters. Import of dredges should be expedited as the volumes dredged annually are still insufficient.

43. Airports: The existing runway in Kimpo airport is sufficient to handle traffic up to 1971 but it should be extended to 10,000 ft. A detailed engineering survey should determine the best location for a second runway - or a new airport. Construction of a second runway or new airport will not be necessary until the beginning of the third five-year plan.

44. Shipping: The present policy of rapidly expanding the sea-going vessel fleet should be re-examined. It is recommended that a detailed survey be made to analyze the financial condition of merchant shipping as well as the potential net contribution of shipping to Korea's foreign exchange receipts. A special study of oil shipping should be conducted before a decision is made about the purchase of crude oil tankers. As far as coastal shipping is concerned, local construction should cover the needs in new vessels, and no more imports should be necessary.

45. Aircraft: The economic feasibility of extending the fleet for international services requires to be studied further. However, there is no doubt about the need for procuring additional aircraft for domestic lines.

46. Needs for external assistance: Technical assistance from abroad is desirable in the following fields. Each of these subjects has been mentioned in some detail in the respective section of the report.

- Railroads: establishment of a new framework for statistical date collection; determination of traffic costing; feasibility of railcar utilization; improvement of coal handling facilities; redesign

of rolling stock and increase of the construction output capacity; review of marshalling yard location and operation; feasibility of line electrification.

- Highways: establishment of a Government Agency for Public Roads; feasibility and preliminary engineering studies of some major highways; training the Korean administrators in the economic analysis of highway transportation.

- Harbors: establishment of a harbor authority; reorganization of the present data collecting system.

- Coordination: establishment of a Coordination Office for the coordination of all transportation planning.

II. RAILWAYS

A. KNR Passenger Transportation

47. The number of passenger-kilometers carried by KNR increased by 25.3% between 1965 and 1966. The Economic Ministers Conference decided on September 1, 1967, to raise the passenger fares by 50%, and the fares were so raised in December 1967. It is likely that this measure, will result in a slight traffic decrease,^{1/} since this is what happened after fare increases in the past (1957 and 1965).

48. Results for the first 8 months of 1967 (6.79 billion pass-km against 5.60 in 1966, i.e. a 21.1% increase) suggest that the 1967 traffic will exceed 10 billion pass-km. The KNR had forecast a volume of 9.83 billion pass-km which is probably too low. For the calculation of traffic after 1967, KNR did not take into account the effect of the proposed fare increase. This effect, however, can only be guessed because there is no good approximation available of the traffic-fare level elasticity.

1/ The KNR passenger transport volume over the 1955-1966 period can be represented by the following equation:

$$x = 1.338 x_1 - 0.3046 x_2 - 2.498 \quad (R = 0.928)$$

x = log of the annual traffic volume in billion pass-km.
x₁ = log of GNP at 1965 constant prices in billion won.
x₂ = log of the pass-km average revenue at 1960 constant prices in hundredths of won.

The elasticity of traffic response to changes in GNP is 1.338, which is a normal level for a developing country. The partial correlation is 0.918, which is significant. The traffic-fare level elasticity is -0.3046, which is unusually low. But the partial correlation is 0.158, which is not significant at all and we will therefore not use this result. A year by year analysis is more helpful. It shows that the traffic-fare level elasticity i) increased regularly since 1955 and ii) is more sensitive to fare increase than to fare decrease. The 1965 traffic decrease suggests in fact a 1965 traffic-fare level elasticity as high as -1.0.

49. The Mission made tentative traffic projections up to 1971. The projections suggest that the traffic forecasts of KNR are too high for 1968, 1969 and 1970, but may be roughly correct in 1971. The KTS forecast is mentioned for comparison. The Mission calculation is based on the following assumption:

traffic-revenue elasticity:	1.34
traffic-fare level elasticity:	-0.5 (fare increase)
" " " "	-0.4 (fare decrease)
GNP increase:	10.5% (1967), 10% (1968), 10 and, as an alternative, 7% (1969, 1970 and 1971)
passenger fare increase:	50% on January 1, 1968
consumer price index increase:	10% (1967), 7% (1968)

	Traffic Projections		KNR forecasts	(KTS)
	High	Low		
1967	10.24		9.83	(9.69)
1968	9.59		10.65	(10.43)
1969	10.87	10.49	11.36	(11.22)
1970	12.33	11.47	12.26	(12.08)
1971	13.98	12.55	13.22	(13.00)

B. KNR Freight Transportation

50. While the KNR commercial freight traffic, expressed in tkm, had steadily increased in the past, with an average yearly growth rate of 15% over the 1955-1965 period, it increased only by 7.4% between 1965 and 1966, in spite of a 13.4% GNP increase. This slackening seems primarily due to the fact that the increase in the capacity offered could not meet the demand increase. In particular, transportation of fertilizer and limestone dropped in a spectacular way. Limestone consumption for agricultural purposes dropped from 450,000 to 174,000 tons. According to KNR and to the Ministry of Agriculture, the car shortage is largely responsible for this decrease. Due to the increases in the freight car stock in 1966 and 1967, and some improvements in efficiency, the situation will improve in 1967. Results for the first eight months are in line with the KNR forecast of a 20.2% increase (total freight) as compared with 1966. All the bottlenecks have not been overcome, however, and the demand for the transport of limestone and other commodities still cannot be met.

51. Freight transportation projections up to 1971, based on the new SFYP targets, appear in table 4. Total traffic will increase from 5.5 billion tkm in 1966 to 9.9 billion tkm in 1971, against 8.6 billion tkm forecast in the KTS. Differences are primarily due to large increases in the transportation volume of coal, cement and POL, in spite of a noticeable shift towards coastal transportation. Partly due to

this shift, the elasticity of the commercial freight traffic in relation to GNP will drop to only 1.15 between 1967 and 1971, as compared to almost 2 in the past. However, the KNR forecasts, which do not take into account the most recent targets established for coal and cement production, seem definitely too low.

C. KNR Operating Results and Tariff Policy

52. The KNR income statements from 1962 to 1966 are provided in table 5 together with the 1967 forecasts. Up to 1965, the financial situation was reasonably favorable and showed a profit even if it was low when compared to the value of the assets (the operating profit was less than 1% of assets in 1965 on the basis of replacement cost of assets). Profit was nil, however, in 1966, and 1967 will show a deficit. The fluctuations of the operating ratio and the recent further deterioration are the result of the tariff policy of the Government. The last tariff adjustment occurred on January 1, 1965, with an increase of 15% in freight rates and 35% in passenger fares. The preceding rate increase had occurred on January 1, 1964, with a 15% increase in both rates and fares. The KNR request to increase freight rates by 20% as of July 1, 1966, was not agreed upon by the Government. The Economic Ministers Conference, however, decided on September 1, 1967, to raise freight rates by 30% and passenger rates by 50%, and this has been done.

53. As a result of the insufficient adjustments made in the past, the pass-km and tkm average revenues at constant prices (table 6) continuously decreased from 1962 to 1967 (with the exception of the year 1965 for the passenger revenues), and the overall operating ratio increased continuously from 1963. The situation is quite different, however, for passenger and freight traffic. According to calculations made by KNR the former is making a profit, while the latter shows a large deficit. It is worth noting, moreover, that the lack of balance in the passenger and freight operating results, considered individually, shows a definite tendency to widen: while the passenger operating ratio decreased from 0.89 to 0.72 from 1962 to 1966, the freight operating ratio increased from 1.09 to 1.29. The last figure shows the sharp financial deterioration of freight transportation.

54. The KNR basic salaries were increased by 23% on April 1, 1967, and worker allowances by 30% on July 1, 1967. A 30% increase of basic salaries is contemplated for April 1, 1968. Other substantial increases in costs have occurred since the beginning of 1967. Even with the recent tariff increases, freight transportation revenues do not yet cover the cost, while passenger traffic continues to subsidize freight tariff to a greater extent than before.

54a. It should be noted in this respect that the 1957 and 1965 fare increases resulted in a substantial decrease of passenger traffic, while freight traffic seemed quite insensitive to fluctuations in the rate level. The Government appears to be concerned by the impact of freight rate increases on the progress of the economy, and does not seem to consider the development of passenger traffic as essential to that progress. Tariff adjustment should occur, however, as soon as possible, not only to correct the present imbalance, but also to allow KNR to achieve a reasonable return on traffic as a whole. It is recommended, moreover, that, to the extent possible, tariff levels reflect the costs for both passenger and freight transportation.

D. Passenger Stock Requirements

55. In 1966, the average fleet throughout the year totalled 1,507 units (railcars and passenger coaches), and passenger transportation amounted to 8,665 million pass-km, i.e. 5,750,000 pass-km per unit. In 1964, 1,314 vehicles had transported 7,353 million pass-km, i.e. 5,596,000 pass-km per unit. These figures indicate on the whole satisfactory improvement in the utilization of passenger rolling stock. The Korea Transportation Mission had assumed in 1966 that, due to the improvement of equipment maintenance, and to the more intensive utilization resulting from heavier traffic and speed increases; the average run per vehicle, which was 258 km per day in 1964, would come to 330 km in 1971 (+28%). On the other hand, it was felt desirable to reduce train congestion ^{1/} by increasing by 15% the number of vehicle-km per pass-km. With these assumptions, the average fleet needed in 1971 to transport 13 billion pass-km was found to be 2,075 vehicles, (2,150 vehicles by the end of 1971) i.e. 6,265,000 pass-km per unit.

56. The increase in passenger stock forecast by KNR (table 7) is in accordance with the 2,150 vehicle target for the end of the SFYP. This can be considered satisfactory even if the 1971 traffic is higher than expected and nears 14 billion pass-km instead of the 13 billion originally projected, in which case there would be a decrease in the load factor of $7\frac{1}{2}\%$. Two points should be noted however:

^{1/} The average number of pass-km per coach-km is about 65, which is very near the number of seats available. Congestion is therefore very high at peak days and peak hours. Definite occupancy records show figures as high as 1.5, 2, and even 2.4 passengers per seat in some trains.

i) The procurement program, as set out in table 7, foresees an increase of the railcar fleet in 1969, 1970 and 1971, which corresponds to the recommendations of the Korea Transportation Mission and approximately maintains in the future the 1964 proportion between railcar-km and total passenger vehicle-km. As an alternative solution, KNR is now contemplating not to increase the railcar fleet and to keep it on its present level of 161 units. In such a case, the passenger coach fleet would have to be increased correspondingly. While it may seem advantageous to meet the traffic development by increasing the unit capacity of the trains, the greater flexibility offered by railcars in organizing passenger services should not be overlooked. A specific investigation should be made before any final decision is taken.

ii) KNR originally planned to meet the passenger coach requirements through local construction and to build 720 coaches during the SFYP. This figure has dropped to 442 so that 230 coaches should be imported in 1968. It is not clear whether this shortcoming is due to insufficient local construction capacity, or to a lack of domestic funds as compared to the possibility of obtaining loans. Measures should be taken to develop local construction of passenger coaches as well as of freight cars.

E. Requirements of Freight Rolling Stock

57. In 1966, the average fleet throughout the year totalled 11,020 cars and total freight transportation amounted to 5,449 million tkm, i.e. 494,000 tkm per car. In 1964, 10,764 cars transported 4,522 million tkm, i.e. 420,000 tkm per car. At the beginning of 1967, the fleet was 11,454 units. Between 1967 and the end of 1971, KNR intends to withdraw 2,789 units, of which 487 will be rebuilt, so that the remaining fleet in 1971 will be $11,454 - 2,302 = 9,152$ units. These cars will be primarily assigned to transportation of general cargo. They can be expected to transport $9,152 \times 500,000 = 4,576$ million tkm.

58. In line with our forecast of 1971 freight traffic (see section B), new freight cars should be procured by KNR for the transportation of $9,865 - 4,576 = 5,289$ million tkm of bulk commodities. It may be expected that about half will be transported by consolidated trains and that, due to turnaround improvement and carload increase, the yearly output per new car will be 700,000 tkm by ordinary train and 880,000 tkm by consolidated train. 1/ With these hypotheses, the total 1971 requirement will be

$$9,152 + \frac{2,644}{0.70} + \frac{2,645}{0.88} = 15,934 \text{ (1971 average)}$$

1/ cf. Korea Transportation Survey, Volume IV - page 125. Yearly output has been slightly diminished to allow for the KNR decision to order 50 t cars instead of 60 t cars as had been suggested.

which corresponds to an average increase of 950 cars per annum from 1967 on, and to a fleet of 16,410 units by the end of 1971. The yearly output per car would then be 619,000 tkm on an average in 1971.

59. Based on traffic in 1971 of 9,280 tkm, the KNR forecast (i.e. 15,500 cars by the end of 1971, or 15,166 cars as 1971 average, see Table 8) corresponds to a quite comparable yearly output per car (612,000 tkm on an average in 1971). But the forecast is definitely too low when the revised targets for economic growth up to 1971 (mentioned in the ORB 1968) are considered. Whereas the changes in stock forecast for 1967 and 1968 are correct, they should be revised for the last three years of the SFYP and increased by 520, 220 and 170 units in 1969, 1970 and 1971 respectively. The result would be an average increase in stock during each of the years 1969, 1970, 1971 of 840 units.

60. An indicative evaluation based on the traffic forecasts per main commodities leads to the following total fleet composition by the end of 1971:

Box cars	:	6,200
Gondolas	:	3,800
Hopper cars	:	3,000
Tank cars	:	1,700
Others	:	1,710
		<u>16,410</u>

61. Comparison with the KNR forecasts shows that the suggested increase in car stock should primarily concern the hopper car fleet (in 1971, transportation of coal, ores and limestone will amount to more than 4,000 million tkm). A detailed breakdown of the year by year requirements could be done only after a more complete technical appraisal of the increase in traffic and KNR operations is carried out. However, some indications are provided below as to the growth of the fleet in 1968 and 1969.

62. In 1968, KNR intends to add to the fleet 600 50 t hopper cars and 500 50 t tank cars, all imported, while local construction will exactly balance the scrapping of old cars. In 1969, KNR intends to import 700 special cars. But scrapping in 1969 would outweigh local construction so that the stock increase would amount to only 320 units. The above recommended average annual increase in stock of 840 units could be attained by importing more units and/or by increasing the output capacity of the construction workshops. As to the 700 special cars, the following remarks can be made:

- Heavy flat cars: 50. With only 47 heavy flat cars of 50 to 70 t capacity, KNR cannot meet at present the heavy commodity transportation demand in relation to the industrial build-up of the country. The proposed addition of 50 cars of 70 to 100 t capacity seems justified.

- Flat cars: 150. This corresponds to a normal fleet increase.

- Refrigerators: 100. KNR cannot meet at present the marine products and fruit and vegetable transportation demand. Traffic is expected to grow from 144 million tkm in 1966 to 213 million in 1971. The proposed addition of 100 cars seems justified.

- Livestock cars: 100. Livestock traffic amounted to 19 million tkm in 1966 and was transported by ordinary cars. The proposed import of special livestock cars does not seem fully justified.

- Ore hopper cars: 300. The proposed addition of 300 new cars to the hopper car fleet is probably insufficient to meet increasing ore transportation requirements.

F. Requirements of Locomotives

63. Table 9 provides the increase in the locomotive stock as forecast by KNR. With the import of 48 and 79 diesel locomotives in 1966 and 1967 respectively in connection with the second and third AID loans, traction will be fully dieselized and the last steam locomotives will be scrapped in 1968. Further imports up to the end of the SFYP will consist of 41 mainline and 10 switching locomotives. These forecasts are roughly consistent with the KTS recommendations to import 37 mainline and 10 switching locomotives for a slightly lower traffic.

64. The revised transportation forecasts, however, lead to a 1971 freight traffic of 9,865 tkm, while the KTS recommendations were based on a traffic of 8,640 million tkm. Additional motive power will be required to transport 1,225 million net tkm, equivalent to $1,225 \times 1.8 = 2,205$ million gross tkm. With the assumption of an average yearly output of 200 million gross tkm per locomotive (KTS Volume IV - page 120), 11 more main-line locomotives will be required in 1971 (7 when compared to the KNR forecasts). Imports should rise to 9, 24 and 25 locomotives in 1969, 1970 and 1971 respectively.

65. In addition to the diesel stock, KNR is now contemplating the import of electric locomotives to be put into service in 1971 because of the electrification of a part of the network and particularly the Jung Ang line up to Yeong Ju and the Ham Baeg line. If electrification is justified in 1971 (the subject is recommended for further study), the diesel stock should be reduced accordingly.

G. Railroad Investments

66. Table 10 provides the railroad investment forecasts for 1967 and 1968 as they appear in the related ORB, together with the investments which had been recommended by the Korea Transportation Mission for the corresponding years. In order to allow comparison, the ORB items have been rearranged by the Mission so as to match the KTS breakdown. A factor which makes comparison difficult is that the investment program in the ORB are drawn up in current prices, while the KTS is in 1965/66 prices. Since the foreign exchange rate has been stable during this period, this does not affect the foreign exchange component of the proposed investment which is approximately one-third of the total. The increase in domestic prices in the investment program over the KTS prices is approximated by the Mission at 10% in 1967 and 20% in 1968.

67. New line construction. Out of a program of 20 new lines initially contemplated by KNR, it had been recommended by the KTS i) to construct only 5 lines, ii) not to construct 13 identified lines, and iii) to defer any decision concerning the Seoul and Pu San circular until feasibility surveys were made. Projects to construct 15 lines have been dropped. However, 2 new lines have been added to the list, which the Mission was unable to study but which appear to have substantial justification. Finally 7 lines are, or will be, under construction in 1967 and 1968.

- (a) Gyeong Jeon line (80.5 km), begun during the FFYP and half complete, to connect the eastern and western parts of the south coast;
- (b) Jeong Seon line (24 km), and
- (c) Mun Gyeong line (12 km), both located in the coal-mining district;
- (d) Jang Hang line (16 km), to provide a connection between Jang Hang and Gun San and shorten the distance between Bi In and the south;
- (e) Bi In line (21 km), to serve the new Bi In industrial area;
- (f) Bug Pyeong line (new: 12.9 km), from Bug Pyeong to Sam Wha, to serve a cement factory under construction.
- (g) Steel mill line (new: 11 km), to serve the Po Hang steel plant.

68. It is likely that the won 420 million provision made in the 1967 ORB for other line construction will not be spent.

69. Station and line capacity. Provisions made in the 1967 and 1968 ORB concern the extension of marshalling yards, in particular in Je Cheon; improvement of loading and unloading facilities at many stations and in particular in Ri Mon Dong near Seoul; enlargement of station yards; lengthening of train meeting tracks; double tracking of the Jung Ang line between Je Cheon and Bong Yang; improvement and extension of station and other facilities in Seoul, Pu San, Dae Gu, Ma San, etc.; and the modernization and extension of signalling facilities.

70. The investment proposed in the ORB for these purposes amounts to won 5.3 billion in 1967 and 1968, i.e. almost twice as much as had been proposed by KTS. The heavy increase in traffic justifies this large investment to increase the station and line capacity. The Korea Transportation Mission, however, was of the opinion that the KNR's projects were too modest and did not allow for the application of more sophisticated techniques. The KTS recommended therefore that comprehensive surveys be made related to i) the marshalling yards location, lay-out, equipment and operations and ii) the coal handling problems. These surveys should be undertaken as soon as possible as any delay in providing sufficient marshalling facilities and loading and unloading facilities would result in serious bottlenecks. However, since the partial survey made by Sofrerail, the conclusion of which was not accepted by the Government, no comprehensive survey of these matters appears to have been undertaken.

71. Way and structure renewal and improvement. The KNR track renewal program consists of i) laying 300,000 concrete ties per year, corresponding to about 170 km of track and ii) replacing 37 kg/m rails by 50 kg/m rails on the lines where increasing traffic should be run by more powerful and heavy locomotives. This program, which had been agreed to by the Korea Transportation Mission, corresponds to annual expenditures of 900 and 750 million won respectively (at 1965 prices). The rail weightening program is starting in 1968 and investments forecast for that year appears adequate. Rehabilitation of bridges foreseen in both years is related to the A and B bridges on the Han River.

72. Rolling stock procurement. The 1967 and 1968 ORB procurement programs do not correspond to the KNR freight stock, passenger stock and locomotive procurement programs which are set out in Tables 7, 8 and 9. One of the reasons for this is a change in the KNR budget after the formulation

of the ORB. Calculations based on the actual requirements suggest that investments should reach won 6.5 and 10.4 billion in 1967 and 1968 respectively. 1/ This is much more than provided in the ORB. However, it will not be necessary to change the KNR budget because the additional expenditure will be covered by foreign loans. Increases in relation to the KTS assumptions derive from (i) increases in unit prices, (ii) increases in the number of units and (iii) substitution, to a certain extent, of imports for local construction.

73. Rolling stock maintenance and construction facilities. Increases in rolling stock require modernization and extensions of maintenance workshops and renewal of a part of the shop machine tools which are generally worn out and obsolete. The output capacity of the construction workshops should be increased in order to substitute to the extent possible local construction for import of freight cars and passenger coaches. As the fleet is expected to increase more quickly than had been forecast by the Korea Transportation Mission, yearly investments should rise accordingly. The 1967 and 1968 ORB provisions seem too conservative. Moreover, no provision is made for the purchase of spare parts, in particular of spare parts for the diesel locomotives.

74. On the whole, and with the reservations made in the brief analysis above, the investments forecast for 1967 and 1968 are adequate.

1/ This calculation is made by the Mission. It is exclusive of the 79 locomotives imported in 1967 instead of 1966 (as had been assumed in KTS). Unit prices are based on the KTS unit prices with 10 and 20% increases in the local currency costs for 1967 and 1968.

	1967			1968		
	No. of units	Unit prices (000 w)	Total cost (million w)	No. of unit	Unit prices (000 w)	Total cost (million w)
Passenger coaches import	-			230	9,700	2,230
Freight cars import	945	4,660	4,400	1,100	4,840	5,320
building	653	3,260	2,130	700	3,520	2,460
rebuilding	-	-	-	50	600	30
Total	1,598	-	6,530	2,080	-	10,040

It must be pointed out that the 1968 investments, taking into account the new estimates for the procurement of rolling stock, are 50% higher than had been forecast by KTS. Similar increases may be expected for the next years. Finally, owing to the traffic increase and to the necessity of improving the present operating conditions, the need for comprehensive and detailed surveys should be emphasized. No provision is made in this respect in the ORB. A list of the fields where consulting services should be sought during the coming year is provided in Section H.

H. Need for Technical Assistance from Abroad

75. Among the surveys which had been recommended by the Korea Transportation Mission in the field of railway transportation, the following may require external consulting services.

76. Statistics: Very detailed statistics are kept, but they are impaired by numerous discrepancies. A general review of all statistical work currently performed should be conducted and a new statistical plan established. In particular, statistics should allow the determination of individual traffic costs. Statistical compilation should be centralized and feasibility of replacing manual work by data-processing equipment should be studied.

77. Traffic costing: The rate structure should be amended to reflect transportation costs more accurately. For that purpose, the actual cost of each category of freight and passenger traffic should be determined. Detailed and accurate data are necessary, moreover, to carry out feasibility surveys on traffic operation and investment programs.

78. Railcar utilization: The future policy of KNR as to the distribution of passenger transportation by trains and railcars is not clear (see Section D). Based on the comparison of costs in both cases, a feasibility survey should determine the most economic share of railcars in passenger transportation.

79. Coal traffic: The handling of the rapidly increasing coal traffic poses numerous problems in the Seoul area. A study should determine the right solution. This study should comprise not only the rail aspects of coal handling, but also other aspects such as storage, truck-loading and distribution problems.

80. Rolling stock: The availability of rolling stock should be increased by means of better preventive maintenance and repair programs. The output capacity of existing construction and rebuilding facilities should be increased in order to substitute local construction for imports whenever this is economic. Finally, new and rebuilt rolling stock should be redesigned with a view to increasing the pay-load, reducing the gross weight pay-load ratio and lowering annual maintenance costs.

81. Marshalling yards: As already pointed out, the location, layout, equipment and operation of the marshalling yards should be reviewed in the light of expected traffic requirements.

82. Electrification: KNR contemplates the electrification of part of the network before the end of the SFYP. According to its forecasts of the increase in the locomotive stock, 58 electric locomotives would be put into operation in 1970. The first two lines to be electrified would be the Jung Ang line from Cheong Ryang Ri to Yeong Ju (217.5 km) and the Ham Baeg line from Je Cheon to Ham Baeg (92 km). Both lines carry heavy coal traffic. Funds to initiate the construction in 1968 amounted to 310 million won. These expenditures were not approved by the Government. Tentative study had led the Korea Transportation Mission to the conclusion that electrification on these two lines might be economically justified during the third five-year plan beginning 1972 in view of the traffic anticipated for 1976. The Mission had consequently recommended undertaking a detailed feasibility survey during the SFYP. Owing to changes in the coal and cement production targets, the traffic expected for 1976 on both lines will be reached in 1970 or 1971. The recommended feasibility survey should thus be initiated as soon as possible; actual electrification outlays should be deferred until the result of the survey is known.

III. HIGHWAYS AND HIGHWAY TRANSPORTATION

A. Highway Transportation

1. Passenger Transport Volume

83. The number of pass-km transported by bus, microbus and taxi has steadily increased with an average yearly growth rate of 17% over the 1955-1965 period. It increased by 44% between 1965 and 1966 (52% for city transportation and 36% for intercity transportation, Table 11). This last jump was made possible by the quick increase in the bus fleet which occurred in 1966 (34%). Results for the first six months of 1967 suggest, however, a slowing down in this progress.

84. The per capita income elasticity was established in the KTS between 3.5 and 4.0 according to the period considered in the past (KTS Volume II, page 160). When these coefficients are applied to the SFYP period with a GNP growth rate of about 10%, an annual growth rate for the number of pass-km is more than 25%. While it is dubious that such a growth rate could be sustained for a long time, it appears sensible to assume that the increase during the SFYP period will not be less than 20 percent per year.^{1/} A similar growth rate may be assumed for private car transportation.^{2/}

2. Freight Transport Volume

85. The development of truck transportation in Korea was much less rapid than of highway passenger transportation (Table 12). Freight transport volume only doubled between 1957 and 1966 while it was 4.7 times higher for passengers. Development between 1965 and 1966 shows a slight annual increase of only 2% in tons and 12% in tkm.^{3/} However, the

1/ KTS assumed growth rates of 17% for bus, 13.5% for microbus and taxi transportation.

2/ No data were available for private car transportation. KTS assumed a 16% growth rate. Liberalization of imports and development of the assembly industry (cars increased by 36% in 1966) justify the assumption of even higher growth rate.

3/ To the extent the MOT statistics may be relied upon. Between 1964 and 1965, the volume of transport increased by 28% in tons, but decreased by 2% in tkm. The corresponding changes in the average transport distance are difficult to believe. The continuous increase of the income per tkm suggests that the number of tkm transported in 1965 and 1966 was actually higher.

statistics on trucking are not very reliable and contain many contradictions, so these findings cannot be considered accurate.

86. The elasticity of freight transportation on the highways to GNP changes was established at about 1.2 in the past (KTS Volume II, page 148). When this coefficient is applied to the SFYP period with a GNP growth rate of 10%, a growth rate of total tkm of 12% is found. Past series cannot be fully relied on, however, to forecast future development, as important changes are expected in the behavior of highway transportation with the improvement of highways and the increase of the truck pay-loads,^{1/} which will result in a decrease in transport cost. In developing countries the elasticity is often around 2.0 and in Korea, where highway freight transportation is starting almost from scratch, a rise in the GNP elasticity seems almost certain. Somewhat arbitrarily it is therefore assumed that 15 to 20% growth rate of highway freight traffic is more likely.^{2/}

3. Tariffs and Financial Results

87. Tariffs for all forms of highway transportation are set by MOT. They have undergone only very small changes during the past ten years, in spite of a general price increase of about 300 percent. However, they were set at a high level in the mid-fifties. A slight increase in the rates occurred in 1961. In January 1966, intercity passenger basic fares rose by 20%, area truck rates remained unchanged, and route truck rates were lowered by 24% (Table 13). In spite of this tariff rigidity, the present fares and rates seem to allow, on the whole, highway transportation enterprises to operate without losses. This suggests that some improvements have been occurring in the management of these enterprises and in the conditions of operation (Table 14).

88. Passenger transportation. A breakdown provided by MOT for the years 1965, 1966 and 1967 shows that the profit-income ratio for intercity bus transportation was 5.6% in 1965, 9.2% in 1966 and 9.4% in the first six months of 1967. City bus firms actually suffered losses in 1965 and 1967.

^{1/} Pay-load is presently limited to 5 t. The Korea Transportation Mission had recommended abandoning the total vehicle weight and cargo maximum load regulations and adopting load-by-axle weight regulations (KTS V. II). This recommendation is still under consideration by the Government. It should be mentioned in this respect that orders have been given already to import 8 t pay-load trucks.

^{2/} KTS assumed a 14% growth rate, which implied a GNP elasticity of 2.

89. Freight transportation. The profit-income ratio increased steadily from 3% in 1961 to more than 10% in 1967. A breakdown provided by MOT for the years 1965, 1966 and 1967 does not show significant differences between the area and route profit-income ratios.^{1/} The continuous increase of income per tkm over the 1961-1966 period cannot be easily explained considering the increase in cost during those years. It is likely that the statistics are incorrect.

B. Motor Vehicle Fleet

90. Altogether 50,160 civil motor vehicles were registered in Korea at the end of December 1966. The composition of the fleet by category and user was as follows.

Passenger car	9,476	Government	9%
Taxi and microbus	10,852	Private	29%
Bus	8,062	Business	62%
Truck	19,432		
Small car	1,322		
Special car	<u>1,016</u>		
	<u>50,160</u>		

91. After a rapid increase between the end of the Korean war in 1953 and 1957, the fleet remained nearly constant at a level of about 30,000 vehicles, up to 1962. From 1962 to 1965, the yearly growth rate was approximately 10%.^{2/} It was 24% between 1965 and 1966 (Table 15). The first six months of 1967 show that the number of vehicles involved in business transportation increased by 16.0% for passenger transportation and 11.8% for freight transportation between December 1966 and June 1967.

92. New vehicles come from three different sources: the UN army surplus sales, imports, and production by assembly plants. Imports have long been heavily restricted due to general scarcity of foreign exchange. This policy has resulted in a reduction in the growth rate of highway transport. Some liberalization, however, came about in 1966 with the import of 2,200 vehicles and higher imports in 1967. Moreover, assembly plants have come into being which are building vehicles from imported or locally produced parts. Local production jumped from 2,000 or less vehicles per annum (1,560 in 1965) to more than 6,000 in 1966 (mostly buses and taxis). Projects to build two large-scale assembly plants with annual outputs of 14,400 and 14,600 vehicles each were recently approved.

^{1/} Area trucks are engaged in city and intercity transportation, route trucks in intercity only. In 1966, area trucks transported 96.5% of total tonnage (in t), provided 84.9% of total income.

^{2/} For the whole fleet. Private passenger cars increased by 29.4%, buses by 10.3%, trucks by 2.1% per annum.

93. With the liberalization of imports, the increase of local car assembly and the rapid development of highway transportation, the vehicle fleet will go on increasing steadily and rapidly. On the basis of rough calculations and assumptions it seems reasonable to assume that about 10,000 vehicles on an average should be added to the fleet during each year of the SFYP (Table 16). With the final assumptions that 20,000 vehicles in service in 1966 will have to be replaced, new vehicles to be purchased over the 1967-1971 period total 70,000, i.e. 14,000 per year on an average (or 50,000, i.e. 10,000 per year on an average, excluding private passenger cars).^{1/} This is more than double the increase estimated in the SFYP. It is important for the Government to take account of the implications for foreign exchange requirements. The 1967 and 1968 ORBs foresee that investment in business transportation vehicles will amount to won 4,994 million in 1967 for 4,120 units, and to won 5,096 million in 1968 for 4,090 units (see breakdown in Table 16, footnote 2). It is likely that actual investments will be much higher.

C. Highway Expenditures

94. Table 17 provides 1966, 1967 and 1968 highway expenditures as actually spent in 1966, appropriated in the 1967 budget, and forecast in the 1968 draft budget. These consist of expenditures for highway investment and maintenance. The figures do not include, however, the construction funds provided under the form of "Joint highway projects" (which are mostly located near the Demilitarized Zone between North and South Korea) by the ROK and US Armies. They also do not include the expenditures made by cities.^{2/} When comparing the yearly expenditures to the overall recommendations made by the Korea Transportation Mission, it should be kept in mind that prices of highway construction increased by 30% approximately between 1965 and 1967, according to estimates provided by MOC. Construction prices are expected to increase further by 40 to 45% between 1965 and 1968.

1/ KTS (v. 32) estimated at 46,000 (or 36,000 excluding private passenger cars) the number of new vehicles to be purchased over the 1967-1971 period.

2/ It is not clear which areas are precisely included in the category "cities", but at least the expenditure made in the Seoul and Pu San special cities are not included. Expenditures for highways in cities are included in the ORBs under the "Municipal Public Works" heading. The 1967 overall Municipal public works investments, according to the 1967 ORB, only amount to won 396 million and are obviously underestimated. The amount jumps to 5,637 million won in the 1968 ORB, almost half of which is dedicated to "Street arrangement".

95. In spite of the price increases, highway appropriations seem to show a definitely rising trend. From a won 647 million^{1/} yearly average during the first four years of the FFYP, funds allocated for national and provincial highways together amounted to won 1.6 billion in 1966 and would reach won 4.9 and 7.3 billion in 1967 and 1968 respectively. Funds allocated to MOC for highways almost doubled between 1966 and 1967, and are to double again between 1967 and 1968. A more detailed analysis shows, however, that highway expenditures are still insufficient, both for investments and maintenance.

1. Highway Investments

96. Bridge construction. A total length of about 50 km^{2/} of bridges remained to be built or rebuilt at the end of the FFYP. This includes bridge connections which were seriously damaged or destroyed during the Korean War and a number of new bridges mostly of obvious high priority. According to the bridge construction program, half of them would have to be built during the SFYP, but actual construction seems to be lagging behind this target. The 1968 ORB foresees for the Baikjae, Kangwha and Keojae bridges a total expenditure of won 842 million (out of an estimated construction cost of won 1,670 million), a part of which was already listed in the MOC 1967 budget; this suggests that a part of the 1967 appropriations will not be spent in actuality.^{3/} Finally, it is likely that the bridge construction appropriations partly include, as in the past, pure maintenance expenditures. The present bridge construction program appears adequate for the needs of the existing highway system, but new highway construction might of course require additional bridges.

97. Road paving. At the end of 1965, the public highway network had a total length of 31,936 km. The length of paved highways, however, was only 1,627 km with the following breakdown:

Paved highways (1965)

National highways	:	1,042 km
Provincial or Special city highways	:	98
City streets and Gun roads	:	<u>487</u>
Total		1,627 km

1/ Exclusive of purchase of heavy equipment.

2/ Exclusive of the second Nag Dong River and the Gun San so-called "toll bridges" which total 4,200 m.

98. During the first four years of the FFYP, road paving amounted to only 125 km per year on an average. One of the most important recommendations of the Korea Transportation Mission was that a considerable increase be made in the allocation of paving funds. The Mission proposed a road paving program of 3,300 km of road paving during the SFYP (city streets excluded), i.e. a yearly average of 660 km.^{1/} Half of this program was justified by the necessity of increasing the capacity of existing gravel roads, which are now heavily congested. The other half was just justified not because of current congestion but because of the expected increase in traffic.^{2/} These recommendations were accepted by the Government and included in the SFYP but in spite of this it seems that the actual length of road paving in 1966 and the planned paving in 1967 and 1968 is even less than before. In 1968, only 120 km would be paved. The MOC has a sub-program for road paving amounting to won 2,800 million and concerning 7 major highways^{3/} with a total length of 448 km. The allocation for the implementation of this sub-program is far too small: the yearly expenditures amount to only won 117, 164 and 192 million in 1966, 1967 and 1968 respectively.

99. Major highways. This item is related to new expressway construction. Out of the won 1,587 million appropriation of the 1968 budget, won 1,500 million are allocated to the Seoul-In Cheon highway. This highway has high priority and its construction was recommended by the KTS. However, the total cost of the highway has been raised considerably by MOC and now amount to won 3,840 million

1/ The reduced program contemplated as an alternative by the Mission (1,650 km of road paving, i.e. 330 km yearly) should be abandoned due to the acceleration of the economic development.

2/ It was found that the minimum level of traffic volume necessary to justify a road paving project was about 200 vehicles per day. This traffic level will be reached on all the considered highways before the end of the SFYP.

3/ Breakdown of sub-program (Source: MOC):

Kwang Ju - Mog Po	84 km	won 900 million
Dae Jeon - Choo Pyung Ryong	76	102
Dae Jeon - Non San	40	127
Dae Gu - Chungcheong Bug Do	56	280
Je Ju - Ouhye	90	320
Jeon Ju - Gun San	49	541
Chung Ju - Cheong Ju	<u>53</u>	<u>530</u>
Total	448	2,800

(for 32 km).^{1/} The remainder of the 1968 allocation, won 87 million, is to be used for survey and design of the Seoul-Su Weon and Sam Cheog-Mug Ho highways. It is dubious, however, that it will be possible to spend won 1,500 million in 1968 on the Seoul-In Cheon highway, since no detailed survey has as yet been made.

100. Road betterment and improvement (other than paving). The total length of roads to be improved in 1968 amounts to 790 km. Most of these are local roads. Only 40 km of the national highways are to be improved in 1968. This is plainly insufficient. Moreover, it is likely that a part of the improvement to be carried out by the local Governments consists more in delayed maintenance than in new investments.

2. Highway Maintenance

101. Highway maintenance works on all roads are carried out by the Provinces and Special cities. Up to 1965, the central Government allocated funds or subsidies to the local Governments for highway maintenance. This rule was changed in 1966, and local budgets had to carry all expenses for highway maintenance, including the national network. Budgeted funds spent on maintenance of national and provincial highways, exclusive of the "Volunteer labor maintenance movement," amounted to about won 230 million in 1964 and 1965, and won 354 million in 1966.^{2/} They amount to won 308 million in 1967. No substantial increase is expected to occur in 1968. The Korea Transportation Mission had estimated that maintenance funds should have reached a level of won 2,200 million in 1966 (inclusive of the work of the "Volunteer labor maintenance movement"), and be increased in the future according to the increase in traffic volume and length of paved network. Comparison of figures shows, however, that no improvement occurred in the Government's attitude as regards highway maintenance. Assuming the effort of the "Volunteer movement" is worth won 800 million, the present budget is less than half the desirable sum to be spent. This is unsatisfactory; allocation of much larger sums for maintenance is needed.

1/ i.e. 120 million won per km. In 1966, the construction cost of the Kim Po-Incheon "toll road" was estimated at 600 million won for 22.6 km, i.e. 26 million won per km. The construction cost of the Seoul-Su Weon "toll road" was estimated at 48 million won per km. The difference cannot be explained by price increases only; obviously the standard of construction is very much higher than contemplated for the Seoul-Su Weon and Kim Po - In Cheon highways.

2/ Only Jeolla Nam Do was responsible for the 1965-1966 increase. In the other eight provinces, the average increase was 8%, which means an actual decrease at constant prices.

3. Heavy Equipment

102. Imports of heavy equipment appear under a special heading in the Government investment programs. These imports are entrusted to the Equipment pool of MOC. Equipment is primarily used for the development of industrial estates, special rural areas and multi-purpose schemes. No part of it seems to be permanently assigned to highway construction or maintenance. For efficient highway construction and maintenance it would be desirable to make part of the pool exclusively available for these purposes. Earth moving and highway construction equipment was imported in 1966 under a Japanese loan for an amount of dollars 6.5 million (won 1,755 million).^{1/} Other imports, included in the 1967 program, are expected in 1968 under an AID loan for an amount of dollars 15.9 million (won 4,300 million + won 215 million local expenses).^{2/} On the other hand, according to the ORB, "imports of heavy construction equipment" would amount to only won 1,821 million in 1967 (478 million for land use equipment, the rest concerning marine equipment, parts and others), and would amount to only won 363 million in 1968. Since only part of these imports are to be used for highway maintenance, it seems clear that these amounts are too small. The Korea Transportation Mission had estimated that imports of equipment worth at least won 2,000 million were necessary during the SFYP for highway maintenance only. According to MOC, highway maintenance equipment is old and insufficient, and spare parts are lacking. It is apparent that new equipment is used for new works only and that highway maintenance is still considered of no importance. A detailed survey should be made in order to determine the equipment necessary for highway maintenance, and equipment should be permanently assigned to this exclusive purpose.

D. The MOC "Major Trunk Highway Construction Plan" and Need for Technical Assistance

103. The two major recommendations made by the Korea Transportation Mission in the field of highways were:

- i) to drastically increase the total length of paved highways by improving and paving 3,300 km of roads, and to improve without paving at least 1,500 km of roads, during the SFYP;
- ii) to establish a "Government Agency for Public Roads" in order to ensure unified command and responsibility, particularly in view of the important investments proposed for the future.

1/ Includes 190 bulldozers, 30 graders, 60 dump trucks, 4 crushers, 4 asphalt mixing plants and other equipment.

2/ Includes 50 scrapers, 10 sheep foot rollers, 10 rollers, 10 crawler dozers, 6 shovels, 20 loaders and other equipment.

103 a. The analysis of the 1967 and 1968 highway budgets shows that the expenditures planned by the Government are insufficient by far to meet the first requirement. Paving of national highways would amount to 68 and 112 km, and road improvement to 24 and 40 km, in 1967 and 1968 respectively. Accumulated delays in the improvement of the present condition of the highway network will be harmful for the development of the national economy. In order to remedy the situation, MOC has initiated discussions with US AID and IDA with a view to obtaining financial and technical assistance to carry out the feasibility and preliminary engineering studies of six major highways:

Seoul - In Cheon	40 km
Seoul - Su Weon	40
Seoul - Gang Reung	263
Po Hang - Pu San - Kwang Ju, including Sun Cheon -	
Yeo Su	463
Sam Cheog - Sok Cho	141
Dae Jeon - Mog Po	<u>297</u>
Total	1,244 km

104. The suggested highway connections are of obvious importance for the development of the country and the list established by MOC is fully approved here although it should be recognized that part of the existing highways may be fully satisfactory in their present condition for many years to come and would perhaps need only minor improvement. The following remarks are in order, however.

(a) It is planned that the Seoul-In Cheon and Seoul-Su Weon roads be entirely new expressways, which would be justified by the development of traffic.^{1/} On the other roads the existing layouts could perhaps be kept, to the extent possible, in order to reduce improvement and new construction costs. A comparison of the construction costs of the six highways, as tentatively established by MOC (Table 18), with the costs estimated by the Korea Transportation Mission, shows that MOC has in mind roads of much higher standards than had been contemplated before. For the Seoul-In Cheon and Seoul-Su Weon expressways, the unit cost per km is estimated according to data provided by MOC at won 132 million and 113^{2/} respectively, against 26 and won 48 million in KTS. The contemplated width of the Seoul-In

1/ In 1965, traffic exceeded 3,000 veh/day on the Seoul-In Cheon and parts of the Seoul-Su Weon existing highways (KTS V. 53). It could easily reach 10,000 veh/day before the end of the SFYP.

2/ In the 1968 MOC budget, the same expressway is 32 km instead of 40, and its cost is estimated at won 3,840 million instead of won 5,280 million which corresponds to won 120 million per km.

Cheon expressway is 31 m against 22 m in KTS. For the other highways, the unit cost per km would range between won 28.5 million for Dae Jeon-Mog Po to won 40 million for Sam Cheog-Sok Cho. It should be realized how much higher these outlays are than the expenditures required for paving and improvement. In the KTS the cost of improving and paving an existing highway with a 7 m wide pavement was estimated at only about won 6 million per km and the cost of new road construction to range from won 12 million in flat terrain to won 22 million in mountainous area. It is clear that, anticipating foreign loans, MOC has drastically changed the scope of the work to be carried out, although perhaps previous estimates were unrealistically low and did not take full account of all cost elements.

(b) In spite of the high costs of the MOC estimations (won 49.9 billion), the total length involved amounts to only 1,244 km. On the other hand, 72% of the roads would not be completed before the end of the third five-year plan. This means that this program cannot replace the program of road paving and improvement, less ambitious but more extensive, which had been recommended in KTS.

105. In addition to the feasibility studies of some of the roads mentioned above, the proposed IDA sponsored survey would provide the Government with (i) a program for the establishment of a new organization which would be responsible for the administration, maintenance and construction of public highways and (ii) recommendations for the improvement of coordination in the administration and planning of all modes of transport. Both objectives correspond to recommendations made by the Korea Transportation Mission.

IV. HARBORS AND SHIPPING

A. Harbor Traffic

106. The total amount of cargo handled in Korean harbors was 13 million tons in 1966. The Mission forecasts an increase to 46 million tons in 1971. This tremendous increase is due to (i) the development of imports, especially POL, and exports, caused by the general economic development, and (ii) the shift from land to coastal transportation for bulk commodities, especially POL, cement and coal. Detailed projections are provided in Tables 19, 20 and 21. Results are summarized as follows:

<u>(million t)</u>	<u>1966</u>	<u>1971</u>	<u>1971 KTS</u>	<u>71-66 ratio</u>
Import dry	5.10	9.35	(4.63)	1.83
Import POL	2.70 ^{1/}	10.40	(4.69)	3.85
Export	1.66	3.65	(2.83)	2.20
Coastal dry (loaded)	1.84	4.84	(3.45)	2.63
Coastal POL (loaded)	0.80 ^{2/}	6.50	(2.80)	8.12

^{1/} Figures corresponds to actual consumption (Source: Korean Oil Corporation).

^{2/} 230,000 t have been added as estimated military transport.

107. Increases in traffic will not affect all harbors in the same way. Changes in the distribution of traffic by commodities, and changes in the production pattern, will modify the present structure of harbor traffic in Korea. For example, with the development of the fertilizer industry in the southeast, imports of raw materials into Ul San and Jin Hae will be substituted for imports of chemical fertilizers into Pu San and In Cheon. In general, the new industrial harbors such as Ul San, Jin Hae, Yeo Su (second oil refinery) and Bi In, will alleviate the burden of rapidly increasing imports into Pu San and In Cheon.

108. Precise projections of the expected traffic per harbor could not be made with the information available to the Mission. Further information needed would be the location and output of future industries, and the breakdown of the present traffic by commodities.^{3/} A few indications are provided

^{3/} The MOT statistics for harbor traffic need improvement on the following points: the category "others" should be replaced by a further breakdown; figures related to POL imports and certain other imports appear unreliable and should be improved; it should be made clear that military traffic is left out of account.

below on the evolution of traffic in the main Korean harbors with relation to the 1966 traffic (Tables 23 and 24). Throughout this analysis, it should be kept in mind that coastal transportation is likely to revert to normal bulk transportation in the future. Further points of importance to the analysis of future harbor development are that: (i) POL handling does not require substantial loading or unloading facilities in any port; (ii) to the extent possible, lumber should be handled overside in lighters or, better, afloat; (iii) coal, minerals and other bulk cargo (fertilizer, cement) should be handled through specialized equipment. In the following analysis only dry cargo traffic is considered, save when exceptions are mentioned.

(a) Pu San is by far the most important harbor in Korea. It handled 4.6 million t dry cargo in 1966, i.e. 45% of total dry cargo handled. Traffic may reach 6.8 million t in 1971. The increase would be due more to development of coastal transportation for bulk commodities than to the increase of general cargo traffic.

(b) In Cheon is the second largest harbor in Korea for general cargo. It handled 1.8 million t dry cargo in 1966. Its activities were characterized in the past by the preponderance of (i) imports over exports, and (ii) sea-going over coastal traffic. Traffic could reach 4 million t in 1971. Increase would primarily be due to the development of import and export general cargo traffic.

(c) Mug Ho loaded 1.3 million t of coal in 1966 (out of a total dry cargo traffic of 1.4 million t). Coal traffic should reach 2.1 million t in 1971. In addition, about 2 million t of cement will have to be loaded, partly in Mug Ho, partly in the nearby harbor of Sam Cheog.

(d) Ul San, site of the first oil refinery, unloaded 1,500,000 t of crude oil (out of a total 1,910,000 t unloaded in Ul San harbor) and loaded 470,000 t of POL products (out of a total of 490,000 t loaded in Ul San harbor) in 1966. Oil traffic is expected to more than double in 1968 when output capacity rises from 55,000 to 115,000 Bbl/day. Similar oil traffic will start in Yeo Su in 1969 (capacity 65,000 Bbl/day). 80% of all POL production is expected to be transported by coastal tankers in 1971. Fertilizer production started in Ul San and Jin Hae in 1967. Imports of raw materials amount to approximately 1,000,000 t, two thirds of which in Ul San, one third in Jin Hae.

(e) Other harbors worth mentioning are Sok Cho (280,000 t of iron ore loaded in 1966) and Po Hang (site of the proposed steel mill, which would require unloading of 1,100,000 t of iron ore and 350,000 t of coke by 1971).

109. According to this analysis the share of Pu San in total dry cargo traffic would decrease between 1966 and 1971 from 46% to 30%, the share of In Cheon would remain stable at 17%, the share of all other harbors would increase from 37% to 53%. On the whole, dry cargo traffic would more than double over the period under consideration.

B. Harbor Investment and Dredging Programs

1. In Cheon

110. The amount of commercial dry cargo handled in In Cheon harbor could reach 4 million t in 1971 (Harbor traffic, Table 24). Military cargo is assumed to remain stable at its present level of 600,000 t per year. All cargo will not be handled in the docks. Part of it (logs, cargo for northern harbor, etc.) will continue to be handled on the roads. Assuming that 20% of imported logs, 75% of commercial cargo and 50% of military cargo are handled alongside the quay, cargo passing through the docks would amount to 2,880,000 t, which would require 3,600 m of quays.^{1/}

111. The second dock, which MOC originally planned to complete by 1970, would present a total quay length of 3,800 m. The first dock already offers 1,100 m of quays (730 m for 4,500 GT vessels + 370 m for 2,000 GT vessels) which is quite convenient for coastal traffic. With a 10%/ yearly increase of traffic, further extensions would not be necessary before 1975. However, following the recommendations of a feasibility survey completed in July 1967, MOC is now contemplating closing off the entire inner harbor by a dam and building two locks through the reclaimed island of Wol Mi Do. The Mission did not have access to the survey, and is therefore not in a position to express an opinion on the merit of this latest proposal. But certainly a very careful comparison of the economics of both solutions is necessary before a decision is taken. Since by our analysis the second dock would be sufficient to accommodate traffic until 1975 and the dock could easily be enlarged after that, we are a priori somewhat doubtful about the new proposal. However the Mission has no doubt about the technical feasibility and economic justification of the construction of the second dock. A few remarks follow:

(a) Changes in the scope of work, and increases in the estimation of unit prices^{2/}, have resulted in a substantial increase in the construction cost of the second dock, which is now estimated at Won 5.1 billion

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- 1/ Assuming that each meter of quay handles 800 t/year. This must be considered a maximum. When tonnage per meter approaches this level, an extension is usually required.
 - 2/ Yearly increase between 1966 and 1971 is estimated at 17.5%. This high figure is partly due, however, to traffic which would be diverted from Pu San.
 - 3/ The construction cost of quay walls was estimated by MOC at Won 200,000 per meter in 1966, at Won 465,000 per meter in 1967. This last figure is much more likely.

plus \$4.4 million^{1/} (i.e. Won 6.3 billion). In addition, dredging is estimated at Won 1.2 billion by MOC. It is worth pointing out that no provision is made in the project for ground facilities (sheds, warehouses, railroads, roads, water supply and lighting) nor for cargo handling equipment, which had been estimated in KTS at Won 2.1 and Won 0.4 billion respectively. Total cost is now Won 10 billion against Won 6 billion in KTS.

(b) It is doubtful that total construction could be completed by 1970, with the first stage completed in 1969.^{2/} It is even doubtful that the amounts provided in the 1968 ORB, Won 1.4 billion (domestic expenditure only) could possibly be spent in 1968.

(c) Pending the construction of the second dock, all other works have been practically stopped in In Cheon harbor. The construction of floating jetties and the improvement of the present ground facilities in the landing stage area, as had been recommended by KTS, could improve, however, the present condition of operation at a reduced cost and should therefore continue.

2. Pu San

112. The amount of commercial dry cargo handled in Pu San harbor could reach 6.8 million t in 1971 (Harbor traffic, Table 24). Military cargo is assumed to remain stable at its present level of 200,000 t per year. Together with the central quay, the piers provide about 4,350 m of berthing space for sea-going vessels, which corresponds to an alongside handling capacity of 3,500,000 t per year. In 1967, pier #2 was rehabilitated and the fishery market was removed from pier #1 to the southern harbor. In 1968 a special coal pier will be constructed. The log basin is being removed to the outer harbor (private investment by Dong Myang Plywood). Even when considering that all coal and most of the logs are not handled at the sea-going quays, it is likely that Pu San harbor will reach saturation towards the end of the SFYP. It is therefore recommended:

(a) to assign special piers and to provide mechanical equipment to handle bulk cargo, particularly cement and minerals;

(b) to consider extending the harbor towards the north outer harbor. According to anticipated traffic development, it might become necessary to initiate the construction before the end of the SFYP period.

1/ Construction includes 3,800 m quay wall, 3,000,000 m³ excavation, 2 locks, enclosing dam, and construction equipment. Construction of 3,800 m quay wall, 2,600,000 m³ excavation, 2 locks, sea wall, and construction equipment less dredger involved in excavation, had been estimated in KTS at Won 2,138 Million plus US\$2,430 (i.e. 2,800 million w).

2/ Detailed design will not be completed before the end of 1967.

3. Other harbors

113. With the only exception of Mug Ho (and the new industrial harbors), all other harbors in Korea were utilized at the beginning of the SFYP at less than 50% of their capacity and do not require substantial new structures or extensions. In general, investments in these harbors should be aimed at improving the loading and unloading facilities, particularly where bulk cargo through coastal transportation is concerned. Improvement of handling facilities and, in special cases, of access conditions, should be studied in relation to traffic requirements and the coastal fleet structure.

114. An appropriation of Won 210 million was made in the 1968 budget for the first stage of construction of a pier for 10,000 GT vessels in Mug Ho harbor, where coal traffic is expected to increase from 1.3 million t in 1966 to 2.5 million t in 1971, while cement traffic could reach or exceed 1 million t by 1971.

115. As far as special harbors are concerned, Jin Hae construction was concluded in 1967; Bi In has not yet started; investments in Ul San harbor are decreasing. The Mission is not in a position to give an opinion on the progress of works in Ul San in relation to the requirements. In Po Hang, only Won 200 million are provided for 1968. A special effort will have to be made in the coming years if the construction of the steel plant takes place.

4. Dredging

116. The annual rate of siltation in harbors is probably less than 1.4 million m³. But lack of dredging during and after the war have led to accumulation of mud and silt in the navigation channels and inner harbors of every port, particularly in In Cheon and Pu San. Total delayed maintenance was estimated at 28 million m³ at the beginning of 1967. In addition new harbor construction will require dredging amounting to 18 million m³. Taking into account new siltation, the total dredging required during the SFYP period amounts to 53 million m³ (Table 26).

117. Annual volume of dredging is still limited by the lack of dredges. 1/ Theoretical capacity at the beginning of 1967 was 1,776 m³/hour, or 4,200,000 m³/year^{2/}, but 37% consisted of old dredges which have to be scrapped. In

1/ Volume and cost of dredging for 1966, 1967 and 1968 are provided in Table 26 according to information provided by MOC. Figures in 1967 and 1968 ORBs are somewhat different.

2/ With 80% efficiency, 10 hour working day basis and 300 workable days per year.

September 1967, three 1,200 hp non-propelling suction dredges with a 420 m³/h output capacity (i.e. 3,000,000 m³/year altogether) were imported^{1/} for reclamation purposes with Japanese funds, but the Government decided to use them in harbor projects (1 in In Cheon, one in Ul San, one in Mug Po). In 1969 the Government expects to receive:

(a) One 300 m³/h suction dredge and one 90 m³/h grab dredge from the Australian Government through the Colombo Plan.

(b) Three 20" suction dredges, one smaller suction dredge, one hopper dredge and one grab dredge, with a total 8.5 million m³ output capacity through a USAID loan. Investment requirement amounts to \$21.6 million + Won 919 million.

118. After these additions to the dredging fleet, total dredging capacity will exceed the requirements of harbors and a part of the fleet could be used for land reclamation. Annual dredging expenditures in harbors should reach Won 2 billion approximately (10 million m³ at 200 w/m³) towards the end of the SFYP period, i.e. twice as much as had been estimated in KTS. Priority should be given to Pu San, where silt accumulation seriously hampers operations, and in In Cheon.

5. Conclusion

119. With the few reservations made above (e.g. improvement of the existing facilities in In Cheon harbor), investments planned for harbors in 1967 and 1968 appear adequate (Table 25). It must be clearly stated, however, that:

(a) the construction of the second dock in In Cheon will, in the coming years, require much more money than originally contemplated;

(b) traffic increase in Pu San may necessitate, before the end of the SFYP, large investments for harbor extension;

(c) bulk cargo handling should be mechanized in all ports in order to reduce the need for additional piers.

120. Quantities to be dredged in 1967 and 1968 are insufficient. The limiting factor is the capacity of the existing dredging fleet, so delivery of new dredges, planned for 1969, should not be delayed. Cost of dredging is expected to reach 2 billion won per year by the end of the SFYP.

1/ Cost of each dredge with ancillary equipment (1 tug boat, anchor barge and pipe): \$1,100,000.

121. The budgeted appropriations for harbor maintenance are definitely too low. This subject is discussed in the following section.

C. Port Finances

122. Port revenues are collected by (i) the Bureau of Customs of MOF (tonnage dues and charges for bonded warehouses) and (ii) the Marine Bureaus of MOT (income from facilities and services: light dues, wharf hire, barge hire, warehouse hire, open stacking area, piers, cranes, water). The level of harbor dues and charges is low when compared with other ports in Asia. Fees did not change in 1966 or 1967. A general increase of about 100% is contemplated for 1968. MOF revenues, which amounted to Won 74.5 million in 1965, probably reached Won 100 million in 1966. The MOT revenues reached Won 139.8 million in 1966. Total revenues were less than Won 250 million in 1966. This is a very small amount when compared with the total volume of harbor traffic. Clearly there is scope for increase in these revenues.

123. Port expenditures are split between (i) the Marine Bureaus of MOT, which are in charge of port operation and aids-to-navigation construction and maintenance, and (ii) the Harbor Section of MOC, which is in charge of harbor construction and maintenance, and dredging. MOT expenditures amounted to Won 238 million in 1966, an insignificant part of which was assigned to maintenance. The MOC expenditures for harbor construction and dredging amounted to Won 3,355 million in that year, while maintenance expenses other than dredging amounted to only Won 45 million (See Table 27). The latter are expected to be Won 62 million in 1968. Apart from the need to coordinate these activities under an independent Port Authority (see following section), the maintenance appropriations are far too low and port revenues should cover at least all operation and maintenance expenses, even after the latter have been raised to an adequate level.

D. Port Administration and Need for Technical Assistance

124. The present organization of Korean Ports has certain weaknesses
(i) Responsibility for port management is divided among numerous authorities as three Ministers are involved in port operation. The absence of unified command deprives the leading government officials of the stimulus of responsibility and achievement.
(ii) The harbor dues system needs to be reorganized to reflect more accurately the cost of harbor services.
(iii) Marine statistics are of sufficient quality and coverage to help ensure efficient operation and planning. These

considerations had led the Korea Transportation Mission to recommend adopting the Port Authority system. No steps apparently were taken as yet in this direction. It is felt that the Government should seek to obtain consulting services to work out:

- (a) a program for the establishment of a Port Authority which would be responsible for the operation, maintenance and construction of harbors in Korea;
- (b) a program for the establishment of an accounting system of the same standard as operated in industrial undertakings;
- (c) a program for the reorganization of the present data collecting system.

E. Ocean-Going Shipping

125. The ocean-going fleet, which had not increased significantly in the 1950's and during the first years of the FFYP, increased very quickly from 1965 on. Tonnage more than doubled between the end of 1965 and the end of August 1967 (Table 28). The fleet capacity increased approximately in the same proportion as the tonnage of imported and exported cargo handled in the harbors, so that the share of the national fleet in ocean transport remained more or less unchanged, at 20 to 25% for imports and 30 to 40% for exports (Table 29).

126. When preparing the SFYP, the Government had estimated that Korean-flag vessels should carry 50% of imports and exports of general cargo, and all bulk imports, such as lumber, raw materials for the fertilizer plants, coal and iron ore for the steel mill, crude oil for the refineries. The Korean Transportation Mission expressed the view that this expansion of the fleet was too rapid and could be dangerous for the profitability and efficiency of shipping. The Mission had recommended limiting the 1971 target to 50% of the general cargo trade with Japan, South-East Asia and USA, and 70% of lumber imports, while deferring any decision about the acquisition of crude oil tankers until a special study was made. With the hypotheses made at the time as to traffic development, this objective required a doubling of capacity during the SFYP by adding 35 vessels totaling 160,000 GT at a cost of US\$60 million (Won 16 billion).

127. The Government adopted this recommendation, as reflected in the 1967 and 1968 ORBs.^{1/} However, action taken by the responsible Ministries

1/	No. of Vessels	GT (1,000)	Amount Required		
			Foreign (1,000 \$)	Local (million w)	Total (million w)
SFYP	35	160	54,000	1,620	15,950
1967 ORB	12	86	9,246	273	2,797
1968 ORB	6	41	13,985	898	4,716
Source:	EPB				

is completely different. According to MOT, 49 vessels totalling 258,000 GT at a cost of US\$ 53.7 million have already been ordered for delivery in 1967 and 1968. According to the same source, it is planned to order, for delivery in 1969, 16 vessels totalling 549,000 GT (including 7 crude-oil tankers with a 60,000 GT average capacity) at a cost of US\$ 175 million (Table 30). This procurement program does not include the vessels to be built in Korean shipyards. According to MCI, total tonnage built in Korea would be 231,000 GT during the SFYP, most of which will be for sea-going transportation. It is also reported that by 1971 the Government would have imported 55 cargo vessels totalling 629,000 GT for US\$ 147 million. First priority will be given to the importation of 30 vessels totalling 270,000 GT for US\$ 64 million (10 freighters, 13 lumber carriers, 2 wheat carriers, 2 ore carriers and 3 tankers, 2 of which with a 33,000 GT capacity). It is not clear to what extent the report on the purchase of 55 vessels may overlap with the MOT information on the ordering of 16 vessels. It is quite clear, however, that the proposed expansion is very large and may lead to an addition of possibly as much as one million tons by 1971 to the present fleet of 300,000 tons.

128. A tentative analysis made by the Korea Transportation Mission showed that Korean shipping contributed considerably to the saving of foreign exchange and that the actual loss of foreign currency (on the national level) would have been three times greater in 1965 if all shipping had been done by foreign vessels. In addition, the financial situation of the Korean Shipping Corporation (KSC), the largest of all companies, was sound and there was a reasonable rate of profit. However, the situation may be different for other companies. Moreover the KSC financial forecast for 1967 shows a dangerous trend towards an increase in foreign currency expenditures (Table 31).

129. The Mission recommends that a detailed survey be made to analyze the financial condition of the operation of sea-going vessels as well as the contribution of shipping to Korea's foreign exchange account. The rate of return of the investments planned should be determined separately in terms of foreign currency and of total value. A special study of oil shipping should be conducted before a decision is made about the purchase of crude oil tankers. When judging the results of these analyses, it should be kept in mind that the possession of a large fleet is not an absolute requirement for the continued economic growth of the country, and that the capital to be invested, mostly in foreign currencies, might be used to greater advantage in other sectors of the economy. It is probable that the shortage of competent crews would not permit a rapid increase in the size of the fleet. In this case priority should be given to the development of the coastal fleet.

F. Coastal Shipping

130. Unlike sea-going navigation, coastal navigation is carried out exclusively by national vessels. Additions to the fleet to meet demand must be considered compulsory in those fields where coastal transportation is the most economic mode of transportation. Although the coastal fleet provides cargo and passenger transportation between the mainland and the numerous islands of Korea, and carries bulk cargo between the ports of the mainland^{1/}, its share in the total domestic traffic volume is modest: 10.7% of total tkm and 1.4% of total pass-km in 1966. In 1966, coastal transportation consisted almost exclusively of coal and POL. It is likely that due to the special conditions and to the cost of sea transportation, general cargo coastal traffic will not increase very much in the future. However, rapid increases in the demand for bulk transportation, and decreases in the transportation cost resulting from increases in ship capacities and improvement in harbors and loading and unloading facilities, will result in a tremendous growth of coastal bulk traffic during the SFYP (Harbor traffic, Table 20).

131. A total tonnage of 130,000 DWT (or 90,000 GT) will be necessary to meet the coastal traffic in 1971 (Table 32). Comparison with 1966 or 1967 is difficult as steel vessels of small capacity could be used for both sea-going or coastal transportation (Table 28, note). The following indications concerning bulk cargo show that the total increase of the bulk-carrying coastal fleet by 1971 should exceed 90,000 DWT.

(a) Coal: The Dae Han Coal Corporation owns 3 colliers of 2,500 DWT and plans to import 2 colliers of 4,000 DWT. More ships, totalling 11,000 DWT^{2/}, will be needed by 1971. According to MOT, vessels presently engaged in sea-going navigation could be assigned to this traffic;

(b) Cement: The Tong Yang Company owns 6 vessels totalling 6,300 DWT. Ssang Ryong Company expects to import a 5,000 DWT tanker. More ships, totalling 10,000 DWT, will be needed by 1971;

(c) Ore: One 3,000 DWT carrier will be needed by 1971;

^{1/} The wide dispersion of traffic renders any analysis difficult. Up to 1966, the MOT Statistical Yearbooks gave results for the 14 main Korean harbors. Traffic in these harbors, however, would represent only 72% of total traffic (Harbor traffic, Table 20, note).

^{2/} 18,000 DWT if the three 2,500 DWT colliers are scrapped.

(d) POL: In September 1967, 11 tankers, with a total 18,500 DWT capacity, had a capacity over 1,000 DWT, and 13 vessels, totalling 29,000 DWT, had to be imported before the end of the year. At least 23,000 DWT will have to be procured in addition by 1971.

132. According to MOT^{1/}, the import of coasters would stop with the delivery of 2 tankers in 1968. This decision seems fully justified as the capacity of local shipyards will be large enough to meet all present and future requirements (Table 30).

133. Tariffs for coastal traffic are decided by MOT. They are still based on circumstances prevailing shortly after the war and do not accurately reflect costs. New freight rates were under study in 1966 and were to come into force before the end of that year. No change occurred, however, in 1966 or during the first nine months of 1967. According to MOT, increases of 30 to 50% for passenger fares, and 30% for freight rates, were to occur before the end of 1967. Changes in the structure of the rates will still be needed.

134. As the cost of transport decreases when the capacity of vessels increases^{2/}, the size of vessels should be as large as possible, taking into account total traffic, its distribution by harbor, and the facilities offered in harbors. Reductions in transportation cost when vessel capacity increases must be balanced against complementary investment and/or maintenance (dredging) expenses in the harbors served. A detailed survey should be made to determine the optimum size of all coasters to add to the fleet for bulk transportation, in relation to investments and maintenance expenses in harbors. It is feared that recent purchases made in Japan were based on the availability of second-hand ships, rather than on precise requirements.

1/ As in the case for sea-going vessels, the provisions made in the 1967 and 1968 ORBs (6 coasters in 1967, 56 coasters - totalling 26,720 GT, i.e. less than 500 GT per vessel - in 1968) are inconsistent with the orders already made.

2/ Approximately according to the function

$$U = KT^{-0.4}$$

where

U = unit transportation cost

T = vessel capacity

K = constant

V. CIVIL AVIATION

A. Air Traffic

135. Air traffic developed between 1960 and 1965 at an average growth rate of 24% for both international and domestic services. The year 1966, however, was characterized by a jump of 70% in international traffic and a decrease of 8% in domestic traffic. Results related to the first eight months of 1967 show increases of 24% for international traffic and 19% for domestic traffic (Table 33).

136. Due to the economic growth of the country, and in accordance with the world-wide trend, international traffic may be expected to go on increasing steadily in the future. 1/ The same should be the case for domestic traffic 2/, as air transport is necessary in Korea due to the mountainous character of the country, the poor condition of the roads and the low commercial speed of trains on most of the runs. The traffic decrease observed in 1966 is due to managerial defects and/or lack of capacity, and not to decrease in demand.

137. Most of the traffic was from the Seoul-Kimpo airport. In 1965, out of the 207,000 domestic passengers carried, 82% enplaned or deplaned in Seoul (59% in Pu San, 26% in Je Ju); out of the 77,000 international passengers carried, 98% enplaned or deplaned in Seoul (2% in Pu San).

B. Infrastructure Investment Programs

138. Owing to a drastic shortage of investment and maintenance funds in the past, many civil aviation facilities on the eight airfields opened to scheduled airlines (Seoul, Pu San, Je Ju, Dae Gu, Kwang Ju, Sam Cheog, Gang Reung, Po Hang) appear either insufficient or poor.

139. In Seoul international airport, the existing runway requires an extension from 8,000 to 10,000 feet. This will be sufficient to handle the 1971 traffic 3/ provided a new passenger terminal and a cargo terminal are built, together with the construction or improvement of taxiway, aprons and other facilities. Similar works are necessary in practically all other air-fields. There is a special need to provide airports with safety equipment (navaids, communication systems, fire-fighting vehicles and ambulances),

1/ At an average annual growth rate higher than 16%, as had been assumed in KTS.

2/ The average annual growth rate of 23% assumed in KTS may be tentatively kept.

3/ It will be insufficient to handle the second generation of subsonic jets and SST. A second runway - or a new airport - will be needed during the third 5-year plan. A detailed engineering study will be necessary in the coming years.

as the ICAO standards are not being met. An AID loan is under way to meet this last requirement. Other investments had been recommended by the Korea Transportation Mission to open a military airbase to civilian traffic (Dae Jeon) and construct new civil airports at Jeon Ju, Mog Po, Jin Ju.

140. Planned investments for 1967 and 1968 amount to won 363 and 977 million respectively (Table 34). Apart from safety investments which are made through a USAID loan, the investments are insufficient^{1/} to make up for the past shortage and match the traffic increase. It is not clear whether the Won 204 million 1968 appropriation for Kimpo airport is destined for the extension of the existing runway or for a first stage of construction of a second runway. As noted above, the extension is urgently required, while a second runway should be delayed up to the end of SFYP.

C. Maintenance and Operation Expenses

141. Maintenance and operation expenses of the MOT Civil Aviation Bureau for infrastructure, gardening, buildings, heating, water, power, and communication and electronics amounted to Won 41 million in 1966 and are planned to be Won 43 million in 1967 and Won 60 million in 1968. They seem insufficient for adequate maintenance of infrastructure.

D. Korean Airlines (KAL)

142. Fleet. KAL is the only important airline operating domestic and international scheduled lines. In 1967 its fleet consisted of:

2 DC-3
1 DC-4
4 F-27, two of which leased in 1967
1 L-1049 H, leased in 1966
1 DC-9-32, bought in July 1967 for US\$5.5 million.

143. The first three aircraft serve domestic lines, the last two serve international lines, while the F-27 may be engaged in both services. International lines consist of the Seoul-Osaka and Pu San-Fukuoka runs. From June 1, 1967, KAL started operating the Seoul-Taipei-Hong Kong line with the L-1049 H.

144. Domestic Tariffs. At the beginning of 1966, one-way fares ranged from 5.7 w/km on Pu San-Je Ju to 8.3 w/km on Seoul-Pu San and 10.5 w/km on Seoul-Gang Reung. On an average, they were twice as much as the second

^{1/} KTS recommended to invest Won 1,050 and 2,011 million in 1967 and 1968, respectively.

class railway fares, which are themselves 25% higher than bus fares and 100% higher than third-class railway fares. They were only 18% higher than the first-class sleeping car fares on the Seoul-Pu San run.

145. While the bus and railway fares remained unchanged, air fares underwent a general increase of 9% on June 15, 1966, and a further increase on August 5, 1967 of 45% on an average (75% on Pu San-Je Ju). After this last increase, the average revenue per passenger-km is approximately 12 Won. 1/ It is worth noting that, in the past, fare increases had no effect on the traffic volume. The fact that demand for tickets often exceeds the number of seats indicates an unsatisfied demand even at the present range of fares.

146. Financial results. Financial results (Table 35) show an operating profit (after depreciation, included in operating expenses) from 1964 to 1966, and a current net profit (after payment of interests) from 1963 to 1966. Results for 1967, however, are less satisfactory, as a loss, estimated at Won 92 million, is expected by the end of the year. A further analysis shows that in the past KAL regularly lost money on domestic flights and made money on international flights 2/ (due to much higher fares, in spite of the higher expenses). It had been one of the recommendations of the Korea Transportation Mission to set the domestic rates so that domestic revenues cover the corresponding expenditures.

147. Management and long-range policy. The emphasis put by KAL on the development of international operations can partly explain the 1966 domestic traffic decrease. 3/ It seems in addition that many flights were cancelled due to poor management and lack of maintenance. In 1967 KAL faced new difficulties in developing its overseas routes when the DC-9 caught fire on September 1 and made an emergency landing at Osaka.

148. As to the development of the fleet 4/, KAL is planning to order:

- 4 F-27 type aircraft for delivery in 1968 or 1969,
- a second DC-9 for delivery in 1969,
- 2 long-range jets for delivery in 1970 or 1971.

1/ It is 50% higher on international lines.

2/ With a very low load factor on the Seoul-Hong Kong-Taipei line, however, the L-1049 H is losing money. It had already lost 22 million Won during the first six months of 1967.

3/ KAL transported 26,000 international passengers in 1966 vs. 11,000 in 1965 (+ 15,000), 208,000 domestic passengers in 1966 vs. 192,000 in 1965 (- 16,000).

4/ The 1967 ORB provided Won 1,501 million for the first DC-9 and Won 273 million for the first F-27. The latter was not ordered. The 1968 ORB provides Won 1,065 million for the second DC-9. No provision is made for additional aircraft on domestic routes.

149. The Mission expresses the opinion that first priority should be given to the development of domestic lines, which appears to be vital for the Korean economy. To meet the traffic increase, the Korea Transportation Mission had estimated that 5 F-27 type aircraft should be added to the fleet during the SFYP, i.e. one aircraft per year. If, as expected, the 2 F-27 leased in 1967 are returned to their owner, the program contemplated by KAL would be insufficient and should be reconsidered.

150. The extension of international airlines is not necessary for economic development. Moreover, the profitability of the operation of one or more DC-9 has never been demonstrated. It is even more dubious that KAL will be in a position to operate long-range jets in an economic way by the end of SFYP. The Mission recommends that an exhaustive financial and economic analysis be made of the feasibility of operating KAL services on international routes, and to defer contemplation of ordering long-range jets for the time being.

ANNEX: COAL, CEMENT AND POL TRANSPORTATION

A. Coal Transportation

(1) The 1971 coal production target, which had been fixed at 13,760,000 t by the SFYP, was reassessed in 1967 at 17,000,000 t. However, the 1971 KNR transport forecasts, from which the needs in rolling stock are derived, are still based upon the old figure and have to be revised. Nearly all coal is transported by railroad. Due to the stiff gradient pass which separates the northern and southern parts of the coal producing Sam Cheog District, most of the output of the important Dog Gye mine is carried to Mug Ho where it is loaded into coasters to Pu San or Ma San or exported directly to Japan. In 1966, transportation cost by coaster was 45% higher than by railroad. With the improvement of marine transportation conditions, however, coastal transportation costs should drop to a competitive level, and the total amount of coal loaded in Mug Ho should increase from 1,200,000 t in 1964 to 2,500,000 t in 1971.

(2) With the completion in 1967 of a second coal pier, the port of Mug Ho has a coal loading capacity of about 2 million t. The port may accommodate vessels of 5,000 DWT, and the storage and loading facilities are excellent. Moreover, an amount of Won 210 million is appropriated in the 1968 budget for a first stage of construction of a pier for 10,000 GT vessels. The unloading facilities in Pu San, however, are very poor as lighters are still used. The construction of a special coal pier, for which a Won 132 million appropriation is made in the 1968 budget, will cut the total marine transportation cost by approximately 20%.

(3) The government-owned Dai Han Coal Corporation owns three 2,500 DWT colliers which carry 550,000 t annually, and has made an application to import two 4,000 DWT colliers with a 600,000 t annual transport capacity. At present the remainder is transported by hired coasters of small capacity. It is obvious that the best transportation conditions are attained when specialized colliers are used with the maximum capacity compatible with the facilities of the harbors to be served. New increases of the collier fleet should be contemplated after a feasibility survey has determined the optimum capacity of the colliers in relation to the improvements to be carried out in harbors. Total capacity needed for coastal transportation of 2 million tons will be approximately 26,000 DWT (18,000 GT).

(4) According to the Dai Han Coal Corporation, the conditions of coal transportation by railroad noticeably improved between 1966 and 1967. In particular, a new stock yard with a 150,000 t capacity was put into operation in Su Saeg in the vicinity of Seoul. Hopper cars are now being used properly, and truck transportation is proceeding smoothly. However, the rolling stock capacity is not fully sufficient to meet the increase in demand. The situation will improve in 1968 with the import of 600 hopper cars through an IDA loan. This problem is dealt with in greater detail in the chapter of railroads.

Coal Transportation
(million t, billion tkm)

		<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>
Production	(t)	9.65	10.25	11.61	13	14	15	16	17
Loaded in Mug Ho ^{1/} (coastal) ^{1/} (export) ^{1/}	(t)	1.2	1.4	1.3	1.8	2.0			2.5
	(t)	{1.0}	{1.2}	{1.2}	{1.6}	{1.7}	{1.8}	{1.9}	{2.0}
	(t)	(0.2)	(0.2)	(0.1)	(0.2)	(0.3)			(0.5)
KNR Transportation ^{2/}	(t)	8.23	8.83	9.98	12.40	13.35	14.30	15.30	16.20
KNR Transportation	(tkm)	1.74	1.85	2.07	2.60	2.72	2.85	2.97	3.10
Coastal ^{3/}	(tkm)	0.35	0.42	0.42	0.56	0.59	0.63	0.66	0.70

1/ Sources: up to 1966, MOT; from 1967 on, estimate by Dae Han Coal Corporation.

2/ Up to 1966: KNR results; from 1967 on, Mission's estimate.

3/ With an average transport distance of 350 km. (Mug Ho - Pu San).

B. Cement Transportation

(5) The 1971 cement production capacity and domestic supply targets, which had been fixed at 5,580,000 t and 4,190,000 t respectively by the SFYP, were reassessed in 1967, at 9,400,000 t for production capacity in 1971 and 7,600,000 t for domestic supply. The increase of production capacity is primarily due to new plants located southeast of Je Cheon, which does not affect the distribution pattern i.e., the average transport distance. However, Tong Yang Cement, located in Sam Cheog, and Ssang Ryong Cement, located in Bug Pyeong (i.e. both plants north of the KNR Yeong Dong line stiff gradient pass), are now planning to use coastal transportation to a greater extent. In spite of this, the KNR 1971 transport forecasts are still on the low side and should be revised upward.

(6) With the completion in May 1967 of the extension project, the annual production capacity of Tong Yang Cement in Sam Cheog rose from 370,000 to 1,000,000 t. Because of the shortage of KNR cars, about one-third of the production is being transported by coasters. The company primarily uses the port of Sam Cheog, located at a distance of only 1.2 km, to which the plant is connected by a small gauge private railroad. It invested Won 70 million in 1967 in dredging and pier construction, so that 2,000 DWT vessels can be accommodated in the harbor, against 300 DWT before. Six small cargo ships (total capacity: 6,300 DWT) and one 1,650 DWT oil-tanker were bought in 1967. Cement is transported in bags, and belt

conveyors and chutes are used for loading. The port of Mug Ho, at a distance of 24 km, is not used by the plant except for export. The company is building two grinding mills in Pu San and Yeo Su. By the end of 1968, clinker instead of cement will be transported in bulk by coasters.

(7) The new Ssang Ryong Cement plant in Bug Pyeong (between Sam Cheog and Mug Ho) will start operating in September 1968 with a 1,700,000 t capacity. At least 400,000 t will be transported by coasters in the first year of operation. All cement will be loaded in the port of Mug Ho to which the plant is connected by a private line. The company will operate its own 5,000 DWT tanker ship for transportation of clinker and cement in bulk.

(8) By 1971, both plants are expected to work at full capacity, with a 2,700,000 t annual production. Only 600,000 t would be transported by KNR, while 1,600,000 t would be shipped by coasters, and 500,000 t by sea-going vessels for export. Due to the physical condition of the railroad line, it is doubtful if the KNR share can be increased. At present, transportation by coaster is more expensive than by railroad, but KNR freight rates are below cost, and improvements in the condition of sea transportation will cut the marine transportation cost. Total capacity needed for coastal transportation of 1,600,000 t will be approximately 21,000 DWT (14,500 GT).

(9) In Sam Cheog, the government intends to improve the harbor facilities so that 5,000 DWT vessels may be accommodated in 1971. In Mug Ho, a 10,000 DWT pier will be under construction in 1968. Unloading facilities should be improved in Pu San. In Yeo Su and Mog Po, unloading alongside quay is frequently delayed as the only pier available is used by passenger boats. Moreover, in Mog Po, the floating pier is connected to the land by a long bridge which prevents mechanical handling. As in the case of coal transportation, a feasibility survey should be made to determine the number and optimum capacity of the coasters necessary, in relation to the improvements to be carried out in harbors.

Cement Transportation

(000t; million tkm)

	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>
Production ^{1/}	778	1,242	1,614	1,880	2,630	3,454	5,364	6,934	8,564
Import ^{1/}	274	28	6	178	488	444			
Export	—	22	55	25	—	—	200	250	500
Domestic									
Consumption ^{2/}	1,052	1,248	1,565	2,033	3,118	3,898	4,873	6,081	7,601
Surplus							291	603	463
Transportation									
Coastal (t) ^{3/}	110	60	60	60	160	400	1,000	1,300	1,600
Coastal (tkm) ^{4/}	—	—	—	—	56	140	350	455	560
Export (t)	—	22	55	25	—	—	200	250	500
KNR (t) ^{5/}	827	1,129	1,517	1,675	2,400	3,000	3,800	4,700	6,000
KNR (tkm) ^{5/}	272	324	412	477	690	820	1,000	1,240	1,580

^{1/} Sources: up to 1966, BOK; from 1967 on, MCT.

^{2/} Including changes in stock.

^{3/} From 1967 on, Tong Yang Cement and Mission's estimate.

^{4/} With an average transport distance of 350 km (Mug Ho - Pu San).

^{5/} Up to 1966, KNR results; from 1967 on, Mission's estimate.

Figures do not include imported cement.

C. Transportation of Petroleum, Oil and Lubricants (POL)

(10) The 1971 POL consumption target, which was fixed at about 4,100,000 t by the SFYP, was reassessed in 1967, at 9,300,000 tons. Production will cover demand in 1969, when the Yeo Su refinery is put into operation, but imports will be necessary again in 1970 and 1971 unless new production units are started. The distribution pattern will change in 1969, with Yeo Su as a new starting point, which, when a third refinery starts producing, may switch to In Cheon, Bi In or elsewhere.

(11) The main fact concerning POL transportation is the increasingly important part to be played in the future by coastal tankers. When the Ul San refinery began producing in 1964, about 60% of the production was shipped by railroad. The KNR share was still 50% in 1967. According to the Korea Oil Corporation, it will not be more than 20% in 1971, in Ul San as well as Yeo Su, and 80% of the production will be transported by tankers. The Corporation rightly estimates that sea transportation is more economical than land transportation, and the utilization of larger tankers, with a capacity of about 5,000 DWT, will cut the cost still further. Terminals

already exist in Pu San and Seoul. New terminals will be completed in 1967 in In Cheon and Mog Po. The most economic transportation of POL from In Cheon to Seoul will be by truck. Oil handling in harbor is relatively simple and does not raise significant problems. Under these assumptions, the tonnage transported by KNR would not increase significantly after 1968 and would be limited to about 2 million t in 1971.

(12) According to the MOT statistics, the tanker fleet at the beginning of 1967 consisted of 118 vessels with a total 17,900 GT (or 34,000 DWT) capacity. In fact, in September 1967, only 11 vessels, with a total 18,500 DWT capacity, had a capacity over 1,000 DWT. In addition, 13 vessels totalling 20,000 DWT had to be imported before the end of the year 1967. A total deadweight tonnage of about 70,000 DWT will be needed in 1971 for the regular transportation of 6,500,000 t of POL products from the refineries to the main harbors, without considering the redistribution to small harbors and the transportation to islands. A detailed survey should be undertaken in order to determine the optimum characteristics of the new tankers to be purchased as well as the right timing of the successive fleet increases.

POL Transportation

(million t, million tkm)

	1964	1965	1966	1967	1968	1969	1970	1971
Production capacity ^{1/}	(1.4)	(1.7)	(1.7)	(2.7)	(4.9)	(7.8)	(8.8)	(8.8)
Consumption ^{2/}	1.8	2.1	2.5	3.8	5.3	6.5	8.2	9.3
KNR Transportation (t) ^{3/}	0.46	0.56	0.69	1.00	1.8	1.9	1.9	2.0
KNR Transportation (tkm) ^{3/}	143	184	238	340	540	570	600	600
Coastal Transportation (t) ^{4/}								
Coastal Transportation (tkm) ^{4/}	80	150	160	720	1,000	1,480	1,760	2,600

1/ Production capacity of the Ul San and, starting in March 1969, Yeo Su, refineries, assuming that:

$$\text{Production in t/year} = \text{production in bbl/day} \times \frac{365}{7.48}$$

2/ Inclusive of military; exclusive of refinery fuel and losses.

Source:

3/ Exclusive of military and KNR service freight.

Source: up to 1966, KNR. From 1967 on, Mission's estimate.

4/ Exclusive of military. Average transport distance of 400 km from 1967 on.

STATISTICAL ANNEX

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Table 1
Mission Forecast of Traffic

	1961	1964	1965	1966	1967	1968	1969	1970	1971	1961-1966	1967-1971	Average yearly increase rate KTS 1964-1971
I. Inland Passengers Traffic (intercity) (billion pass-km)												
KNR	5.37	7.35	6.92	8.67	10.2	9.6	10.9	12.3	14.0	10.1%	10.1%	8.5%
Bus	2.04	2.98	3.64	4.93	5.9	7.1	8.5	10.2	12.3	19.3%	20.0%	17.0%
Micro and taxi	0.20	0.16	0.60	0.89	1.1	1.3	1.5	1.8	2.2	34.8%	20.0%	13.5%
Charter bus	0.01	0.15	0.17	0.19	0.2	0.3	0.3	0.4	0.5	-	20.0%	17.0%
Private car	0.32	0.50	0.60	0.72	0.9	1.0	1.2	1.5	1.8	17.6%	20.0%	16.0%
Airplane	0.02	0.05	0.06	0.06	0.1	0.1	0.1	0.1	0.2	23.7%	23.0%	23.0%
Water transport	0.11	0.21	0.20	0.22	0.2	0.3	0.3	0.3	0.4	9.5%	10.0%	9.5%
Total	8.10	11.70	12.19	15.68	18.6	19.7	22.8	26.6	31.4	14.1%	14.9%	11.80%
Annual increase rate	13.0%	4.2%	28.6%	18.6%	5.9%	15.7%	16.7%	18.0%	-	-	-	-
II. Inland Goods Traffic (billion tkm)												
KNR	2.69	3.91	4.43	4.76	5.9	6.6	7.3	8.2	9.1	12.1%	13.8%	10.6%
Truck	0.32	0.51	0.50	0.56	0.7	0.8	0.9	1.1	1.3	11.8%	17.5%	14.0%
Coastal Shipping (Dry) (POL)	0.24 (0.22) (0.02)	0.48 (0.40) (0.08)	0.63 (0.48) (0.15)	0.64 (0.48) (0.16)	1.4 (0.7) (0.7)	1.8 (0.8) (1.0)	2.6 (1.1) (1.5)	3.0 (1.2) (1.8)	4.0 (1.4) (2.6)	21.4% 16.9% 51.5%	44.5% 21.5% 74.5%	18.1% 11.7% 33.6%
Total	3.25	4.90	5.56	5.96	8.0	9.2	10.8	12.3	14.4	12.9%	19.3%	11.7%
Annual increase rate	14.6%	13.5%	7.2%	34.2%	15.0%	17.4%	13.9%	17.1%	-	-	-	-
III. Harbor Traffic (million t loaded and unloaded)												
Import	2.45	4.16	5.17	6.77	10.95	13.05	14.45	16.70	19.75	22.5%	23.9%	9.9%
Export	0.96	1.06	1.58	1.66	1.92	2.31	2.79	3.18	3.65	11.6%	17.1%	16.2%
Coastal	2.23	3.51	4.55	4.59	8.70	10.82	11.80	17.16	22.68	15.5%	37.5%	14.1%
Total	5.64	8.73	11.30	13.02	21.57	26.18	32.04	37.04	46.08	18.2%	28.8%	12.4%
Dry	5.37	7.18	9.30	10.08	13.87	15.48	17.64	19.39	22.68	13.4%	17.6%	10.5%
POL	0.27	1.55	2.00	2.94	7.70	10.70	11.40	17.65	23.40	61.3%	51.4%	17.0%
Annual increase rate	15.7%	29.4%	15.2%	65.7%	21.4%	22.4%	15.6%	24.1%	-	-	-	-
IV. Air Traffic (1,000 passengers)												
International	30.9	60.7	77.5	131.4	158	190	228	274	328	33.5%	20%	16.0%
Domestic	61.5	174.9	207.5	191.6	236	290	356	438	539	25.5%	23%	23.0%
Total	92.4	235.6	285.0	323.0	394	480	584	712	867	28.4%	22%	21.4%

Source: (See transport sectorial analyses in this report)

Table 2

Share of Transports in the National Economy
 (Billion won at 1965 constant prices)

	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>
GNP	589.07	613.61	634.97	693.03	750.31	805.85	913.82
Gross value added of Transportation							
Railroads	5.80	5.44	5.69	6.50	7.42	7.63	8.25
Motor Vehicles	5.34	5.49	6.41	7.97	9.35	12.21	14.90
Marines	2.10	1.92	1.90	2.12	2.42	3.03	3.86
Others	1.63	1.85	2.11	2.15	2.39	2.68	3.13
Total	14.87	14.70	16.11	18.74	21.76	25.55	30.15
%	(2.53)	(2.40)	(2.54)	(2.70)	(2.91)	(3.18)	(3.30)
Domestic fixed capital formation							
	62.48	72.95	77.99	137.27	114.41	118.48	207.38
Capital formation of transportation							
Railroads						4.85	9.83
Highways						2.12	4.77
Harbors						1.30	1.65
Others						9.74	21.76
Total	8.89	12.17	16.48	21.70	14.82	18.01	38.01
%	(14.1)	(16.7)	(21.1)	(15.8)	(12.9)	(15.2)	(18.4)

Source: Bank of Korea, National Accounts.

Incremental capital output ratio, derived from the domestic fixed capital formation of transportation from 1962 to 1966, divided by the increase of gross value added during the same period (1966 value less 1961 value) = 7.08.

Table 3

Transportation Investments in 1967 and 1968
according to ORBs
(Million won)

	<u>1 9 6 7</u>	<u>1 9 6 8</u>
<u>Railroads</u>		
New line construction	2,858	2,949
Station and line capacity	2,385	2,879
Way and structure renewal & improvement	965	2,065
Rolling stock procurement	6,331	8,368
Rolling stock maintenance and construction facilities	450	508
Miscellaneous	209	544
Total	<u>13,198</u>	<u>17,313</u>
<u>Highways</u>		
Central Government		
Bridge construction	851	1,107
Road paving	629	513
Major highway	35	1,587
Industrial and tourist highways	180	213
Road betterment	197	320
Maintenance and others	165	260
Sub-total	<u>2,057</u>	<u>4,000</u>
Local Government	<u>2,800</u>	<u>3,254</u>
Total	<u>4,857</u>	<u>7,254</u>
<u>Motor Vehicles</u>	<u>4,994</u>	<u>5,096</u>
<u>Harbors</u>		
Major harbors	1,224	1,721
Small harbors	262	1,306
Fishing harbors	-	125
Dredging	454	1,001
Others	<u>74</u>	<u>50</u>
Total	<u>2,014</u>	<u>4,203</u>
<u>Shipping</u>		
Sea-going vessels	2,797	4,716
Coastal vessels	<u>1,243</u>	<u>2,594</u>
Others	<u>130</u>	<u>72</u>
Total	<u>4,171</u>	<u>7,382</u>
<u>Airports</u>	<u>364</u>	<u>977</u>
<u>Aircraft</u>		
International flights	1,501	1,065
Domestic flights	<u>273</u>	<u>-</u>
Total	<u>1,774</u>	<u>1,065</u>
<u>TOTAL</u>	<u>31,372</u>	<u>43,290</u>
(Storage)	<u>(254)</u>	<u>(1,951)</u>
(Total Transportation and Storage)	<u>(31,626)</u>	<u>(45,241)</u>

Source: ORB.

Mission appraisal of these amounts: see following page.

Mission Appraisal of Probable Amount of Investment in 1967 and 1968
 (for more details, see sectorial analyses)

Railroads: It is likely that, in 1967, 420 million won for new line construction will not be spent. According to KNR rolling stock procurement program, actual rolling stock investments in 1967 and 1968 would be 6.5 and 10.4 billion won respectively.

Highways: At least 10% of the so-called investments are in fact maintenance expenditures.

Motor Vehicles: It is likely that actual investments will be much higher.

Harbors: MOC port construction and dredging figures are different (except 1968 dredging figures) and total 2,214 and 3,837 million won in 1967 and 1968 respectively. Investments in fishing harbors are not transportation investments.

Shipping: Actual investments will be much higher as orders have already been made amounting to 7,050 and 9,130 million won, in 1967 and 1968 respectively, only for imported vessels. Local construction and major repairs should be added.

Airports: No comment.

Aircraft: The 273 million won provision for domestic flights will not be used in 1967.

Tentative adjustments by the Mission based on the foregoing follow (million won):

	<u>1967</u>	<u>1968</u>
Railways	12,950	19,350
Highways	4,350	6,500
Motor vehicles	9,000	10,000
Harbors	2,200	3,850
Shipping	7,500	10,500
Airports	360	980
Aircraft	<u>1,500</u>	<u>1,065</u>
Total	37,860	52,245

Table 4

KNR Freight Transportation Mission Estimates

(million tkm)

	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>KTS 1971</u>
Grain	289	295	318	350	357	364	372	380	(321)
Fertilizer and limestone	250	338	207	250	300	400	490	560	(566)
Coal	1,740	1,849	2,070	2,600	2,725	2,850	2,975	3,100	(2,450)
Imported coal	28	25	7	25	25	30	30	35	(35)
Ores	231	262	269	290	325	400	475	625	(625)
Lumber	61	90	94	100	110	120	140	160	(159)
Cement	324	412	476	690	820	1,000	1,240	1,580	(1,405)
POL	143	184	238	340	540	570	600	600	(494)
Others	841	973	1,076	1,240	1,415	1,615	1,840	2,105	(1,885)
Total commercial	3,907	4,428	4,755	5,885	6,617	7,349	8,162	9,145	(7,940)
KNR service freight	226	229	291	280	290	300	310	320	(300)
Military freight	389	387	403	400	400	400	400	400	(400)
Total	4,522	5,044	5,449	6,565	7,307	8,049	8,872	9,865	(8,640)
KNR forecasts					6,548	7,050	8,010	8,610	9,280
<u>% yearly increase</u>									
Commercial	13.3	7.4	23.8	12.4	11.1	11.1	12.0		
Total freight	11.5	8.0	20.5	11.3	10.2	10.2	11.2		
KNR forecasts			20.2	7.7	13.6	7.5	7.8		

- Notes:
1. Grain: The new 1971 production target has not significantly changed, when compared with the SFYP original target. However, increases in the transportation volume in 1966 and 1967 denote changes in the distribution pattern (substitution of domestic production for imports).
 2. Fertilizer and limestone: The KTS traffic target has been kept. A slight increase in the 1971 fertilizer production target is balanced by the introduction of some coastal transportation. Total transport includes 600,000 tons of limestone for agriculture and 175,000 tons for the Po Hang steel industry.
 3. Ores and lumber: The KTS traffic target has been kept, although it is a pessimistic hypothesis, probably on the low side.
 4. Coal, cement and POL: See Annex.

(continued on next page)

(Table 4 continued)

5. Others: According to the KNR statistics, the "other commodities" are fruits and vegetables; marine products; processed food; beverages and tobacco; metal; machinery; ceramics; textiles; straw; salt; livestock; miscellaneous; and other imports. The latter two items represent two-thirds of the total. The KTS 1971 traffic projections were based on the 1971/65 GNP increases as established in the SFYP. It was estimated that the "other commodities" traffic would increase at a 12.2% yearly growth rate between 1964 and 1971. The revised traffic projections assume that i) the transportation of half of the "other commodities", mainly related to agricultural production, will increase at the same 12.2% growth rate, and ii) the transportation of the rest, mainly related to manufacturing production, will increase at a 15.8% yearly growth rate corresponding to a GNP growth rate of 10% in the remainder of the SFYP.

Table 5

KNR Income Statements
(million won)

	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u> ^{1/}	<u>1966</u>	<u>1967</u> ^{2/}
<u>Operating revenues</u>						
Passengers	3,752	4,257	5,317	6,573	8,384	11,274
Freight	3,069	3,885	4,501	5,540	6,054	7,245
Other	220	247	548	983	1,265	-
Total	<u>7,042</u>	<u>8,389</u>	<u>10,366</u>	<u>13,096</u>	<u>15,703</u>	<u>18,519</u>
<u>Operating expenses</u>						
Before depreciation	4,770	5,632	7,710	9,560	12,698	15,957
Depreciation	<u>1,974</u>	<u>1,899</u>	<u>2,050</u>	<u>2,027</u>	<u>2,226</u>	<u>3,223</u>
Total	<u>6,744</u>	<u>7,531</u>	<u>9,760</u>	<u>11,587</u>	<u>14,924</u>	<u>19,180</u>
Operating income	298	858	606	1,509	779	-661
Non-operating income	78	-494	559	163	322	-60
Interest	-6	-20	-350	-297	-375	-770
Net income	370	344	815	1,375	726	-1,491
Net operating ratio (after depreciation)	0.96	0.89	0.94	0.88	0.95	1.04

Evaluation of KNR Assets at Constant 1964 Prices

Fixed assets	61,421	64,099	63,516	65,253
Current assets	<u>5,047</u>	<u>7,002</u>	<u>10,269</u>	<u>12,885</u>
Total assets	<u>66,468</u>	<u>71,101</u>	<u>73,785</u>	<u>78,148</u>

-
- 1/ Had depreciation been calculated on the basis of the replacement costs instead of the book values, the 1965 necessary depreciation annuity (equipment, tracks and structures) would have totalled 3,437 million won instead of 2,627 (2,027 as "depreciation" and 600 as actual track renewal expenditures), i.e. an increase of 800 million won (see KTS IV.13). The same remark applies for 1966. Net operating ratios jump to 0.95 in 1965 and 1.00 in 1966.
- 2/ KNR forecasts take into account actual increases in salaries and allowances and a 20% freight rate increase from July 1, 1967. In fact no rate changes had yet occurred on October 1, 1967. This means that freight revenue in 1967 will not amount to won 7,245 million but drop to won 6,586 million. The net operating ratio will probably jump to 1.07.

Table 6

KNR Traffic Unit Average Revenue Development

	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u> 1/
<u>Passengers</u>						
Revenue (million won)	3,752	4,257	5,317	6,573	8,384	
Traffic (million pass-km)	5,869	6,676	7,353	6,917	8,665	
Revenue at current prices (1/100 won per pass-km)	63.9	63.8	72.3	95.0	96.5	(96.5)
Consumer price index (1960 = 100)	115.2	139.0	180.0	204.4	229.7	(252.7)
Revenue at constant prices (1/100 won per pass-km)	55.5	45.9	40.2	46.5	42.0	(38.2)
Operating ratio 2/	0.89	0.82	0.82	0.71	0.72	
<u>Freight</u>						
Revenue (million won)	3,069	3,885	4,501	5,540	6,054	
Traffic (million tkm)	3,742	4,067	4,296	4,815	5,158	
Revenue at current prices (1/100 won per tkm)	82.0	95.5	104.8	115.1	117.4	(117.4)
Wholesale price index (1960 = 100)	123.8	149.3	201.1	221.2	238.0	(254.7)
Revenue at constant prices (1/100 won per tkm)	66.2	63.8	52.1	52.0	49.3	(46.1)
Operating ratio 2/	1.09	1.04	1.13	1.11	1.29	

1/ Assuming that the consumer price index will increase by 10%, the wholesale price index by 7%, between 1966 and 1967 (Cf. ORB 1968).

2/ According to KNR calculations with revaluation of assets as from 1964/1965 (see Table 5).

Table 7
KNR Forecast of Passenger Rolling Stock

	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>
A. <u>Stock on January 1</u>						
Railcars	83	163	161	161	181	213
Coaches (and trailers)	1,370	1,398	1,398	1,558	1,679	1,787
Total	<u>1,453</u>	<u>1,561</u>	<u>1,559</u>	<u>1,719</u>	<u>1,860</u>	<u>2,000</u>
B. <u>Changes in stock during year</u>						
Imported : Railcars	85 ^{1/}			20	32	45
: Coaches			230			
Locally built: Coaches	50			149	148	145
Scrapped : Railcars	-5	-2				
: Coaches	-22		-70	-70	-70	-70
Rebuilt : Coaches				42	30	30
Total	<u>108</u>	<u>-2</u>	<u>160</u>	<u>141</u>	<u>140</u>	<u>150</u>
C. <u>Stock on December 31</u>						
Railcars	163	161	161	181	213	258
Coaches	1,398	1,398	1,558	1,679	1,787	1,892
Total	<u>1,561</u>	<u>1,559</u>	<u>1,719</u>	<u>1,860</u>	<u>2,000</u>	<u>2,150</u>

1/ First Japanese loan.

Table 8

KNR Forecast of Freight Car Rolling Stock

	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>
A. <u>Stock on January 1</u>						
Box cars	3,833	4,199	4,701	4,601	5,542	5,712
Gondolas	3,414	3,863	4,300	4,250	3,362	3,612
Hopper cars	1,494	1,471	1,471	2,071	2,082	2,082
Tank cars	793	952	1,172	1,622	1,769	1,769
Others	1,053	1/ 969	1,149	1,349	1,458	1,657
Total	10,587	11,454	12,793	13,893	14,213	14,832
B. <u>Changes in stock during year</u>						
Imported	565	2/ 945	3/ 1,100	4/ 700	5/ 900	950
Locally built	472	653	700	400	-500	-500
Scrapped (-)	-199	-259	-750	-780	219	218
Rebuilt	29		50			
Total	867	1,339	1,100	320	619	668
C. <u>Stock on December 31</u>	11,454	12,793	13,893	14,213	14,832	15,500

1/ Breakdown of others: Flat cars 603
 Refrigerators 184
 Cabooses 266
 Total 1,052

2/ Of which 536 through the first Japanese loan.

3/ Of which 795 through the second Japanese loan and 150 by the Korea Oil Corp. (KOCO).

4/ Of which 600 hopper cars and 450 tank cars through the second IDA credit.

5/ Of which: Heavy flat cars 50
 Flat cars 150
 Refrigerators 100
 Livestock cars 100
 Ore hopper cars 300
 Total 700

Table 9

Locomotive Stock Growth
KNR Forecasts

	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>
A. <u>Steam locomotives</u>						
Stock on January 1	272	261	110			
Scrapped during year	-11	-151	-110			
Stock on December 31	<u>261</u>	<u>110</u>	<u>0</u>			
B. <u>Diesel locomotives</u>						
Stock on January 1	125	173	252 ^{1/}	252	260	281
Import during year ^{2/}	48	79	8	21	22	
Stock on December 31	<u>173</u>	<u>252</u>	<u>252</u>	<u>260</u>	<u>281</u>	<u>303</u>
<u>Diesel locomotive utilization</u>						
Passenger	)	81	81	84	92	99
Freight	)	124	124	127	137	148
Switching ^{3/}	<u>13</u>	<u>47</u>	<u>47</u>	<u>49</u>	<u>52</u>	<u>56</u>
Total	173	252	252	260	281	303
C. <u>Electric locomotives</u>						
Stock on January 1						58

1/ Breakdown: Small diesel 811 - 887 hp = 115
Medium diesel 1,329 hp = 47
Large diesel 1,775 hp = 29
" " 1,826 hp = 61

Total 252

2/ Imports after 1968 consist of:

41 mainline locomotives type 2,000 - 2,400 hp. Present largest are 1,826 hp.

10 switching locomotives type 200 hp

3/ Switching locomotives in addition to the above mentioned 10 200 hp type are provided by the existing SW8 and G8 locomotives type 811 and 887 hp.

Table 10

Railroad Investments
(million w)

		1967		1968	
		O R B	K T S	O R B	K T S
<u>New line construction</u>					
Gyeong Jeon	80.5 km	1,625	1,015	813	908
Jeong Seon	24 km	460	626	800	496
Mun Gyeong	12 km	103	100	550	305
Jang Hang	16 km		308	100	315
Bi In	22 km	50	501	100	470
Bug Pyeong	12.9 km (New)	200		301	
Steel mill line	11 km (New)			285	
Others		420			
Total		2,858	2,550	2,949	2,494
<u>Station and line capacity</u>					
Seoul area		64	470	337	471
Marshalling yards		200)	133)	316)	278)
Loading and unloading facilities		269))))
Building improvement and enlargement		64	100	170	200
Signalling and track extension		760	748	806	331
Enlargement of station yards - Improvement of station facilities		1,028	-	1,250	-
Total		2,385	1,451	2,879	1,280
<u>Way and structure renewal and improvement</u>					
Track		830	1,637	1,757	1,637
Bridges		135	74	180	74
Equipment			18	128	35
Total		965	1,729	2,065	1,746
<u>Rolling stock procurement</u>					
Locomotives			-		-
Passenger stock			810		1,013
Freight stock			4,089		3,493
Total		6,331	4,899	8,368	4,506
<u>Rolling stock maintenance and construction facilities</u>					
Spare parts			397		397
Sheds, workshops		450	448	508	448
Total		450	845	508	845
<u>Miscellaneous</u>					
Communications		28	65	225	65
Electric power and lighting		52	55	70	55
Office mechanization			13		13
Consultant services			160		160
Others		129	-	249	-
Total		209	293	544	293
<u>Total</u>		13,198	11,767	17,313	11,165
<u>Contingencies</u>		-	1,177	-	1,117
<u>GRAND TOTAL</u>		13,198	12,944	17,313	12,282
(Of which foreign exchange)		(-)	(35.6%)	(35.0%)	(33.2%)

Table 11
Motor Vehicle Passenger Transportation
(Billion pass-km)

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
<u>Intercity Transportation</u>												
Bus	0.85	0.91	1.22	1.28	1.59	1.84	2.04	2.41	2.39	2.98	3.64	4.93
Microbus and Taxi	0.04	0.06	0.07	0.09	0.18	0.18	0.20	0.28	0.38	0.46	0.60	0.89
Chartered Bus	<u>0.01</u>	<u>0.01</u>	<u>0.02</u>	<u>0.02</u>	<u>0.02</u>	<u>0.02</u>	<u>0.01</u>	<u>0.06</u>	<u>0.12</u>	<u>0.15</u>	<u>0.17</u>	<u>0.19</u>
Total	0.90	0.98	1.31	1.39	1.79	2.04	2.25	2.75	2.89	3.59	4.41	6.01
<u>City Transportation</u>												
Bus	0.66	0.71	0.95	0.99	1.25	1.23	1.34	1.39	1.45	1.86	2.27	3.19
Microbus and Taxi	<u>0.10</u>	<u>0.15</u>	<u>0.19</u>	<u>0.23</u>	<u>0.44</u>	<u>0.46</u>	<u>0.50</u>	<u>0.70</u>	<u>0.95</u>	<u>1.16</u>	<u>1.30</u>	<u>2.25</u>
Total	0.76	0.86	1.14	1.12	1.69	1.69	1.84	2.09	2.40	3.02	3.57	5.44
<u>Total</u>	<u>1.65</u>	<u>1.83</u>	<u>2.46</u>	<u>2.61</u>	<u>3.48</u>	<u>3.73</u>	<u>4.08</u>	<u>4.83</u>	<u>5.28</u>	<u>6.61</u>	<u>7.98</u>	<u>11.46</u>

Based on data provided by MOT. For assumptions, see KTS II., 150 sq.

Table 12

Truck Transportation
(million t, billion tkm)

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
Goods Transported (ton)	3.1	5.1	6.0	8.8	9.8	10.3	15.3	16.9	16.0	18.7	24.0	24.5
Tkm	0.11	0.18	0.26	0.31	0.34	0.36	0.32	0.38	9.42	0.51	0.50	0.56

Based on data provided by MOT.
For assumptions, see KTS II., 70 sq.

Table 13
Highway Transportation Tariff Developments
(W per pass-km and tkm)

	<u>1960</u>	<u>1961</u>	<u>1966</u>
Intercity passenger basic fare	0.8	1.10	1.33
Area truck basic rate 1/	5.5	6.20	6.20
Route truck basic rate	20.0	23.00	18.50

1/ When there is no return freight, a 50% increase is allowed.

Table 14
Highway Transportation Business Financial Results

(Income and profit = million w)
 (Income/unit = w)

	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>Jan.-June 1967</u>
<u>Bus (city and intercity)</u>								
Income	2,207	2,758	4,159	4,713	5,726	7,343	12,237	7,758
Profit	108	111	262	255	100	185	855	377
Ratio (%)	5.0	4.0	6.2	5.5	1.7	2.5	6.9	4.9
Income/pass-km	0.72	0.82	1.09	1.23	1.18	1.24	1.51	
<u>Microbus</u>								
Income	522	726	858	1,284	1,686	2,131	3,709	2,251
Profit	76	61	64	99	116	148	15	152
Ratio (%)	14.6	8.4	7.5	7.7	6.9	6.0	0.4	6.8
<u>Taxi</u>								
Income	787	1,105	1,072	2,019	2,506	3,552	7,444	5,045
Profit	152	99	74	317	247	270	632	510
Ratio (%)	19.3	9.0	6.9	15.7	9.9	7.6	8.5	10.1
<u>Truck</u>								
Income	1,992	2,002	2,403	2,752	3,131	3,973	5,872	4,106
Profit	85	61	114	177	207	378	634	497
Ratio (%)	4.3	3.0	4.7	6.4	6.6	9.5	10.8	12.1
Income/tkm	5.5	6.2	6.3	6.6	6.1	7.9	10.5	

Source: MOT.

Table 15

Civil Vehicle Fleet Growth, 1965-1966

		<u>1965</u>	<u>1966</u>	<u>Increase %</u>
Passenger car	Government	1,649	1,883	14.2
	Private	5,580	7,593	36.1
	Taxi	5,854	8,176)
	Microbus	<u>3,197</u>	<u>2,676</u>	<u>19.9</u>
		16,280	20,328	24.9
Truck	Government	1,659	2,020	21.8
	Private	3,874	4,773	23.2
	Business	<u>10,482</u>	<u>12,639</u>	<u>20.6</u>
		16,015	19,432	21.3
Bus	Government	78	96	23.1
	Private	239	291	21.2
	Business	<u>5,720</u>	<u>7,675</u>	<u>34.2</u>
		6,037	8,062	33.6
Small car	Government	219	116	-
	Private	1,532	1,169	-
	Business	634	37	-
	(Motorcycles)	<u>(-1,071)</u>	<u>-</u>	<u>-</u>
		1,314	1,322	-
Special car	Government	177	289	-
	Private	447	599	-
	Business	<u>170</u>	<u>128</u>	<u>-</u>
		794	1,016	28.0
<u>Total</u>	Government	3,782	4,404	-
	Private	11,672	14,425	-
	Business	26,057	31,331	-
	(Motorcycles)	<u>(-1,071)</u>	<u>-</u>	<u>-</u>
		40,440	50,160	24.0

Source: MOT.

Table 16

Purchase of Motor Vehicles, 1967 - 1971

	<u>Number 1966</u>	<u>Number^{1/} 1971</u>	<u>Old cars not replaced</u>	<u>To be purchased 1967-1971</u>	<u>Unit^{2/} cost (thousand w)</u>	<u>Total cost (million w)</u>
Passenger car	9,476	24,000	5,000	19,000	500	9,500
Taxi and microbus	10,852	25,000	7,000	18,000	600	10,800
Bus	8,062	18,000	4,000	14,000	1,300	18,200
Truck	19,432	28,000	13,000	15,000	1,600	24,000
Small and special	2,338	5,000	1,000	4,000	300	1,200
Total	50,160	100,000	30,000	70,000		63,700

1/ As in KTS (V. 30), the numbers of vehicles in 1971 are calculated for each category separately on the basis of the transport volume increase, assuming that the average yearly distance covered by all cars, and the average truck pay-load, will increase by respectively 15 and 20 percent between 1966 and 1971.

2/ Unit costs are nearly the same as in KTS in spite of the substantial price increase since the KTS was written (about 15 percent). They are consistent with the assumptions made by EPB for the calculation of the 1968 ORB. They are less, however, than the factory prices (less tax) computed by Asia Motors for the output of its projected assembly plant. It is difficult to judge who is right, but the Mission is inclined to think that ORB provisions are based on under-estimation of cost.

	1 9 6 8 O R B			ASIA	MOTORS *
	<u>Number</u>	<u>Unit Cost</u>	<u>Total Cost</u>		
Taxi and microbus	600	528	317	Large bus	6,974
Bus	790	1,232	973	Middle bus	1,305
Truck	2,400	1,547	3,713	Large truck	4,095
Other	300	310	93	Middle truck	2,074
Total	4,090		5,096		

* A joint venture in cooperation with Saviem and Renault Engineering.

Table 17

Highway Expenditures

(million won)

	1966 Expenditures		1967 Budget		1968 Draft Budget	
	Work	Amount	Work	Amount	Work	Amount
A. <u>Central Government (MOC)</u>						
Bridge construction	2,656m	580	3,598m	851	1,900m	1,107
Road paving	86km	393	68km	629	112km	513
Major highway construction			2km	35	16km	1,587
Industrial road construction	3km	41	8km	144	13km	173
Tourist highway			7km	36	8km	40
Road betterment	21km	91	24km	197	40km	320
Highway maintenance	-	0	-	165	-	240
Preliminary survey and planning			-	-		
Total		1,104		2,057		20
						4,000
B. <u>Local Government</u>						
Bridge construction					978m	
Road paving					8km	
Improvement					750km	
Maintenance	-	354	-	143	-	
Total		529		2,800		3,254
C. <u>Total expenditures</u>		1,633		4,857		7,254

Sources: A: MOC
 B: 1966 and 1967: MOC; 1968: EPB
 C: EPB (1967 and 1968 ORBs)

Highway SFYP/KTS proposals (heavy equipment and technical assistance excluded)

Projects	Work	(1965 price million won)
		Amount
Bridge construction	25,815 m	4,700
Road paving	3,300 km	19,000
Road construction and improvement	1,500 km	4,500
Industrial roads	218 km	1,000
Toll roads	143 km	3,250
Toll bridges	4,200 m	1,850
Miscellaneous	-	1,500
Sub-Total		35,800
Surveys, studies and supervision		4,200
Total		40,000
Allowance for contingencies 10%		4,000
Grand Total		44,000

Table 18

MOC Plan for Highway Construction and Improvement
(Surveys to be made with USAID and IDA assistance)
 (million won)

(Figures in parentheses are in \$1,000)

Order of Priority	Section	Length (Kms)	Characteristics	Estimated Construction Costs			Construction Schedule		Unit Cost Per Km
				Local Fund	Foreign Fund	Total	Engineering	Construction	
1	Seoul-In Cheon	40	Expressway, ^{1/} S = 120 Km/hr w = 31 m	4,224 (15,360)	1,056 (3,840)	5,280 (19,200)	1968	1968-1970	132.0
2	Seoul-Su Weon	40	Expressway, ^{2/} S = 100-120 Km/hr, w = 24 m	3,616 (13,149)	904 (3,287)	4,520 (16,436)	1968-1969	1969-1971	113.0
3	Seoul-Gang Reung	263	Partial limited access, good characteristics S = 80-100 Km/hr, w = 17-22 m	6,744 (24,524)	1,686 (6,131)	8,430 (30,655)	1968-1969	1969-1971	32.1
4	Po Hang-Pu San-Sun Cheon-Yeo Su-Kwang Ju	463	Expressway and partial limited access, good characteristics, S = 80-120 Km/hr, w = 17-22 m	12,276 (44,640)	3,069 (11,160)	15,345 (55,800)	1968-1969	1970-1976	33.1
5	Sam Cheog-Sok Cho	141	Partial limited access, good characteristics, S = 100 Km/hr, w = 22 m	4,512 (16,407)	1,128 (4,102)	5,640 (20,509)	1968-1969	1969-1976	40.0
6	Dae Jeon-Mog Po	297	Partial limited access, good characteristics, S = 80-100 Km/hr, w = 17-22 m	6,776 (24,640)	1,694 (6,160)	8,470 (30,800)	1968-1969	1969-1976	28.5
	Total	1,244		38,148 (138,720)	9,537 (34,680)	47,685 (173,400)			38.3
	Purchase of heavy equipment				2,217 (8,061)	2,217 (8,061)			
	Grand Total				11,754 (42,741)	49,902 (181,461)			40.1

^{1/} Including 8 km within cities.^{2/} Including 6 km within cities.

Table 19

Mission Forecast of Cargo Handled in Harbors - Imports and Exports

(1,000 t)

	<u>1965</u>	<u>1966</u>	<u>Jan.</u>	<u>Aug.</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>
<u>Imports</u>									
Grain	637	558	(634)		1,150	800	800	600	400
Fertilizer	1,125	829	(647)		1,350	1,850	2,000	2,150	2,200
Cement	12	190	(341)		500	450	0	0	0
Lumber	518	1,010	(761)		1,100	1,200	1,300	1,400	1,500
Coal	116	105	(68)		100	150	150	200	550
Minerals	0	0	(0)		0	0	0	0	850
Other									
Dry Cargo	<u>1,860</u>	<u>2,404</u>	<u>(1,809)</u>		<u>2,650</u>	<u>2,900</u>	<u>3,200</u>	<u>3,500</u>	<u>3,850</u>
Total Dry Cargo	<u>4,260</u>	<u>5,096</u>	<u>(4,260)</u>		<u>6,850</u>	<u>7,350</u>	<u>7,450</u>	<u>7,850</u>	<u>9,350</u>
POL	<u>906</u>	<u>1,676</u>	<u>(2,064)</u>		<u>4,100</u>	<u>5,700</u>	<u>7,000</u>	<u>8,850</u>	<u>10,400</u>
Total	<u>5,174</u>	<u>6,772</u>	<u>(6,324)</u>		<u>10,950</u>	<u>13,050</u>	<u>14,450</u>	<u>16,700</u>	<u>19,750</u>
<u>Exports</u>									
Grain	8	58	(0)		0	50	55	55	60
Fertilizer	0	6	(0)		0	60	100	100	100
Cement	36	18	(26)		0	0	120	150	300
Lumber	35	36	(28)		200	220	245	270	300
Coal	218	153	(141)		200	100	100	100	100
Minerals	859	726	(197)		760	770	800	820	700
Marine Products	13	19	(9)		100	160	190	220	250
Other Cargo	<u>408</u>	<u>647</u>	<u>(515)</u>		<u>660</u>	<u>950</u>	<u>1,180</u>	<u>1,470</u>	<u>1,840</u>
Total	<u>1,577</u>	<u>1,663</u>	<u>(916)</u>		<u>1,920</u>	<u>2,310</u>	<u>2,790</u>	<u>3,185</u>	<u>3,650</u>

Note: Cargo handled in the following harbors: In Cheon, Gun San, Jang Hang, Mog Po, Yeo Su, Ma San, Pu San, Ul San, Po Hang, Mug Ho, Je Hu, Chung Mu, Sam Chon Po, Sok Cho, except for the first 8 months of 1967, where the last 3 are excluded. Jin Hae is included in the list from 1967 on.

For 1965, 1966 and I-VIII 1967, source MOT.

Military cargo excluded, except for POL from 1967 on.

Projections for exports are based upon the unofficial Ministry of Commerce and Industry export target of \$1 billion by 1971. Quantities have been calculated from the values, on the base of the 1966 unit prices, as they may be derived from the BOK statistics (Table 22). They may differ, but not widely, from the corresponding quantities to be found elsewhere in this report. "Lumber" includes, from 1967 on, veneer sheets. "Other cargo" has been calculated assuming that its average unit price should remain constant over the 1966-1971 period. With the hypotheses made, the 1970 figures correspond to a \$800 million export program.

Such a method could not be applied to the projections for imports as no breakdown was available. "Grain" projections have been provided by the Ministry of Agriculture. "Fertilizer" includes chemical fertilizers and raw materials for fertilizers. The 1971 consumption, according to estimates provided by the Ministry of Agriculture (316,000 t nitrogen + 222,000 t phosphorous + 148,000 t potash), corresponds to a total quantity of 2,100,000 t of chemical fertilizers. As raw materials are processed in the plants (1971 capacity: 1,400,000 t) without changes in weight; and as 100,000 t of locally produced fertilizers are to be exported in 1971, total imports will be 2,200,000 t in 1971. The same calculation has been made for the preceding years. Figures for "lumber" are arbitrary. "Coal" consists of bituminous coal and coke, and includes in 1971 350,000 t of coke for the steel plant. "Minerals" only concerns iron ore for the steel plant. "Other dry cargo" is assumed to rise at a 10% growth rate per annum. "POL" figures exceed by 8% the consumption figures to take into account refinery consumption and losses.

Table 20

Mission Forecast of Cargo Handled in Harbors - Coastal Navigation

(1,000 t)

	<u>1965</u>	<u>1966</u>	<u>Jan.-Aug.</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>
<u>Unloaded</u>								
Grain	90	86	49	90	90	90	100	100
Fertilizer	13	39	29	100	100	150	200	250
Cement	65	59	75	160	400	1,000	1,300	1,600
Lumber	21	21	18	25	25	30	30	30
Coal	1,046	1,116	926	1,600	1,700	1,800	1,900	2,000
Salt	54	55	31	55	55	60	60	60
Minerals	38	16	7	40	40	50	50	250
Fresh fishes	107	110	69	120	130	140	150	150
Other dry cargo	348	335	243	360	370	380	390	400
Total dry cargo	1,782	1,837	1,447	2,550	2,910	3,700	4,180	4,840
POL	489	569	470	1,800	2,500	3,700	4,400	6,500
Total	2,271	2,406	1,917	4,350	5,410	7,400	8,580	11,340
<u>Loaded</u>								
Grain	33	29	21					
Fertilizer	72	51	40					
Cement	13	6	6					
Lumber	5	9	10					
Coal	1,217	1,168	950					
Salt	23	14	7					
Minerals	17	6	56					
Fresh fishes	18	6	126					
Other dry cargo	278	321	257					
Total dry cargo	1,676	1,610	1,473					
POL	606	574	542					
Total	2,282	2,184	2,015					

Note: Cargo handled in same harbors as in Table 19 but without exception for the first 8 months of 1967. According to MOT statistics related to this last period, total coastal cargo loaded and unloaded in Korean harbors, inclusive of small mainland and off-shore harbors, amounted to 5,498,000 t vs. 3,932,000 in said harbors. Consideration of these secondary harbors explains, to a certain extent, the differences which appear in the past
 (continued on next page)

(Note on Table 20 continued)

series between the amounts of cargo loaded and unloaded.

For 1965, 1966 and I-VIII 1967, source MOT.
Military cargo excluded.

Projections for "cement", "coal", "fertilizer", and "POL" coincide with projections by major suppliers such as Tong Yang Cement, Dae Han Coal Corporation, Jin Hae Chemical and Korean Oil Corporation (see specific analyses in annex). "Minerals" includes in 1971 iron ore transported from Sok Cho to Po Hang. Coastal transport of other commodities is assumed to remain low.

The MOT projections for all harbors, inclusive of small mainland and off-shore harbors, amount to 4,568,000 t and 8,200,000 t for 1967 and 1968 respectively. Compared to the Mission's projections, they correspond to a traffic, lower in 1967, higher in 1968.

Table 21

Mission Forecast of Total Cargo Handled in Harbors
 (1,000 tons)

	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>
<u>Unloaded</u>												
Import	2,451	2,449	3,700	4,397	4,163	5,174	6,772	10,950	13,050	14,450	16,700	19,750
Coastal	971	1,158	1,490	1,527	1,599	2,271	2,406	4,350	5,410	7,400	8,580	11,340
Total	<u>3,422</u>	<u>3,608</u>	<u>5,189</u>	<u>5,923</u>	<u>5,761</u>	<u>7,445</u>	<u>9,178</u>	<u>15,300</u>	<u>18,460</u>	<u>21,850</u>	<u>25,280</u>	<u>31,090</u>
Dry	3,310	3,455	5,005	5,713	4,631	6,050	6,861	9,400	10,260	11,150	12,030	14,190
POL	112	153	184	210	1,130	1,395	2,317	5,900	8,200	10,700	13,250	16,900
<u>Loaded</u>												
Export	582	964	803	862	1,061	1,577	1,663	1,920	2,310	2,790	3,185	3,650
Coastal	895	1,073	1,593	1,694	1,912	2,282	2,184	4,350	5,410	7,400	8,580	11,340
Total	<u>1,477</u>	<u>2,037</u>	<u>2,396</u>	<u>2,556</u>	<u>2,973</u>	<u>3,859</u>	<u>3,847</u>	<u>6,270</u>	<u>7,720</u>	<u>10,190</u>	<u>11,765</u>	<u>14,990</u>
Dry	1,414	1,915	2,186	2,377	2,549	3,253	3,219	4,470	5,220	6,490	7,365	8,490
POL	63	122	210	179	424	606	628	1,800	2,500	3,700	4,400	6,500
<u>Total handled</u>												
Sea-going	3,033	3,413	4,503	5,259	5,224	6,751	8,435	12,870	15,360	17,240	19,885	23,400
Coastal	1,866	2,231	3,083	3,221	3,511	4,553	4,590	8,700	10,820	14,800	17,160	22,680
Total	<u>4,899</u>	<u>5,645</u>	<u>7,585</u>	<u>8,479</u>	<u>8,734</u>	<u>11,304</u>	<u>13,025</u>	<u>21,570</u>	<u>26,180</u>	<u>32,040</u>	<u>37,045</u>	<u>46,080</u>
Dry	4,724	5,370	7,191	8,090	7,180	9,303	10,080	13,870	15,480	17,640	19,395	22,680
POL	175	275	394	389	1,554	2,001	2,945	7,700	10,700	14,400	17,650	23,400

Source: 1960-1966: MOT data.

Table 22

Export Program by Commodity
 (Q = quantity in thousand t)
 (V = value in million US\$)

	1966		1967		1968		1969		1970		1971	
	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q
Fish and fish products	(21)	58	(37)	100	(58.5)	160	(69)	190	(80.5)	220	(91)	250
Cereals	(7)	40	(0)	0	(9)	50	(9.5)	55	(10)	55	(10.5)	60
Crude fertilizers and minerals	(1)	243	(5.5)	340	(6.5)	390	(6.5)	400	(7)	420	(7.5)	450
Iron and other ores	(21)	694	(23)	760	(23)	770	(24.5)	800	(25)	820	(21)	700
Coal	(1.5)	162	(1)	100	(1)	100	(1)	100	(1)	100	(1)	100
Chemical fertilizers	(0)	0	(0)	0	(6)	60	(9)	100	(9)	100	(9)	100
Veneer sheets	(30)	152	(40)	200	(44)	220	(48)	245	(53)	270	(58)	300
Cement	(0.5)	25	(0)	0	(0)	0	(2.5)	120	(3)	150	(6)	300
Total	(85)	1,374	(106.5)	1,500	(148)	1,750	(170)	2,010	(188.5)	2,135	(204)	2,260
Others	(165)	289	(213.5)	420	(322)	560	(450)	780	(611.5)	1,050	(796)	1,390
Grand Total	(250)	1,663	(350)	1,920	(470)	2,310	(620)	2,790	(800)	3,185	(1,000)	3,650
Import program ^{1/}	(716)	6,772	(822)	10,905	(1,094)	13,050	(1,156)	14,450	(1,254)	16,700	(1,371)	19,750

1/ Import program is provided for sake of comparison only: source MCI for V; Q as in table 1.

Sources: 1966 V and Q : BOK.

1967-1971 V : MCI. "\$1 Billion Export Program".

Table 23

1966 Harbor Traffic
Breakdown by Harbor
 (1,000 tons)

	I N			O U T			<u>Total</u>
	<u>Sea-going</u>	<u>Coastal</u>	<u>Total</u>	<u>Sea-going</u>	<u>Coastal</u>	<u>Total</u>	
In Cheon	1,486	246	1,732	151	31	182	1,914
Gun San	245	30	275	28	0	28	303
Jang Hang	93	2	95	0	0	0	95
Mog Po	84	120	204	24	53	77	281
Yeo Su	72	90	162	44	46	90	252
Ma San	100	233	333	36	21	57	390
Pu San	2,729	1,331	4,060	888	318	1,206	5,266
Ul San	1,892	16	1,908	57	429	486	2,394
Po Hang	41	87	128	6	21	27	155
Mug Ho	24	35	59	144	1,178	1,322	1,381
Je Ju	8	96	104	1	44	45	149
Chung Mu	1	28	29	5	9	14	43
Sam Chon Po	1	23	24	3	2	5	29
Sok Cho	0	68	68	276	32	308	376
Total	6,776	2,405	9,181	1,663	2,184	3,847	13,028

Note: Military cargo excluded.

Source: MOT data.

Table 24

Mission Forecast of 1971 Pu San and In Cheon Harbor Dry Cargo Traffic

(1,000 tons)

	Pu San		In Cheon		Others		Total	
	1966	1971	1966	1971	1966	1971	1966	1971
<u>In</u>								
Grain	268	0	296	440	80	60	644	500
Fertilizer	187	250	199	300	484	1,900	870	2,450
Cement	159	850	32	50	59	700	250	1,600
Lumber	482	700	456	700	94	130	1,032	1,530
Coal	797	1,300	21	100	324	1,150	1,142	2,550
Minerals	9	0	0	0	8	1,100	17	1,100
Others	<u>1,671</u>	<u>1,900</u>	<u>569</u>	<u>1,300</u>	<u>666</u>	<u>1,260</u>	<u>2,906</u>	<u>4,460</u>
Total	3,573	5,000	1,573	2,890	1,715	6,300	6,861	14,190
<u>Out</u>								
Grain	17	20	2	0	68	140	87	160
Fertilizer	19	20	2	0	36	330	57	350
Cement	13	0	7	0	4	1,900	24	1,900
Lumber	5	160	37	160	3	10	45	330
Coal	16	0	0	0	1,295	2,100	1,311	2,100
Minerals	371	400	71	100	290	450	732	950
Others	<u>624</u>	<u>1,200</u>	<u>63</u>	<u>800</u>	<u>276</u>	<u>700</u>	<u>963</u>	<u>2,700</u>
Total	<u>1,065</u>	<u>1,800</u>	<u>182</u>	<u>1,060</u>	<u>1,972</u>	<u>5,630</u>	<u>3,219</u>	<u>8,490</u>
<u>Total</u>	<u>4,638</u>	<u>6,800</u>	<u>1,755</u>	<u>3,950</u>	<u>3,687</u>	<u>11,930</u>	<u>10,080</u>	<u>22,680</u>

Notes: 1966 Results from MOT data.

1971 projections correspond to the following assumptions:

Grain: No more import into Pu San as Gyeongsang-Nam-Do production exceeds consumption.Fertilizer: About 1,400,000 t of raw materials are imported and 100,000 t of chemical fertilizer exported, at Ul San and Jin Hae; 800,000 t of other imports and 250,000 t coastal are distributed as in the past, with higher increase in Gyeonggi-Do.Cement: 1,600,000 t coastal transportation and 300,000 t export going out of Mug Ho and Sam Cheog. More than half of coastal transportation unloaded in Pu San.Lumber: No change in distribution of import. Export of plywood through In Cheon and Pu San.Coal: 2,000,000 t coastal and 100,000 t export going out of Mug Ho.

(continued on next page)

(Table 24 continued)

Minerals: 850,000 t import and 250,000 t coastal transportation entering Po Hang. In addition to coastal transportation, 700,000 t export leaves harbors. Distribution similar to 1966.

Others: It has been arbitrarily supposed that, owing to (i) the emphasis put on the economic development of the Seoul-In Cheon area, (ii) the diversion of harbor traffic from Pu San to In Cheon as a consequence of the major works planned in In Cheon, and (iii) the increasing importance of industrial and other harbors in Korea, the "other" distribution is considerably altered. In 1971 Pu San would handle about 50% more than In Cheon, which in turn would handle slightly more than all other harbors together.

Table 25

Investments in Harbors
(million W)

	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>Annual investments recommended in KTS (average 1967-1968)</u>
<u>Special Harbors</u>				
In Cheon second dock			1,350	
Ul San	1,269	485	166	
Bi In	22	70	5	
Jin Hae	661	31		
Po Hang			200	
	—	—	—	—
Total	<u>1,952</u>	<u>586</u>	<u>1,721</u>	<u>(1,189)</u>
<u>Main Harbors</u>				
In Cheon	70	161		(103)
Mog Po	20	60	93	(94)
Yeo Su	63	47	30	(142)
Pu San	119	150	132	(140)
Je Ju	30	48	95	(60)
Po Hang	12	15	10	(14)
Mug Ho	30	116	210	(375)
Sam Cheog	22	50	30	
Sok Cho	23	21		
Gun San			26	(25)
Ma San			45	(11)
	—	—	—	—
Total	<u>389</u>	<u>668</u>	<u>671</u>	<u>(964)</u>
Other Harbors	<u>389</u>	<u>342</u>	<u>394</u>	<u>(250)</u>
Grand Total	<u>2,730</u>	<u>1,596</u>	<u>2,786</u>	<u>(2,403)</u>

Source: MOC. Figures concern actual expenditures in 1966, approved budget in 1967, draft budget for 1968. Figures in 1967 and 1968 ORBs are somewhat different (Table 27).

Table 26

Dredging Requirements and 1966-1968 Dredging Programs
 (1,000 m³)

	<u>Delayed maintenance or investment (1967-1971)</u>	<u>Annual siltation</u>	<u>Dredging programs</u>		
			<u>1966</u>	<u>1967</u>	<u>1968</u>
<u>Delayed maintenance</u>					
In Cheon	7,392	600	418	626	<u>1/</u>
Jan Hang	1,624	58	37	38	38
Gun San	1,897	88	102	101	65
Mog Po	1,629	80	79	249	600
Yeo Su	101	19	28	17	-
Pu San	10,467	250	495	544	334
Po Hang	1,888	25	46	64	53
Je Ju	161	13	25	22	22
Mug Ho	285	27	85	47	34
Others	<u>2,869</u>	<u>160</u>	<u>996</u>	<u>256</u>	<u>65</u>
Total	<u>28,313</u>	<u>1,310</u>	<u>2,311</u>	<u>1,964</u>	<u>1,216</u>
<u>New harbors projects and extension</u>					
Ul San	8,200	60	2,373	1,806	1,700
Jin Hae	500	1	-	-	-
Bi In	4,680	-	-	-	-
In Cheon	4,500	-	-	-	<u>1,950¹</u>
Total	<u>17,880</u>	<u>61</u>	<u>2,373</u>	<u>1,806</u>	<u>3,650</u>
Grand Total ^{2/}	<u>46,193</u>	<u>1,371</u>	<u>4,684</u>	<u>3,770</u>	<u>4,867</u>
Cost (million W)			625	618	1,002
Unit cost (W/m ³)			133	164	206

1/ Maintenance and the new project in In Cheon are grouped in "investment".

2/ Total requirement during SFYP period:

Delayed maintenance	28.3 million m ³
Investment dredgings	17.9 million m ³
Annual siltation 1,371 x 5 =	6.8 million m ³
Total	53.0 million m ³

Source: Requirements: KTS
 Programs: MOC

Table 27

Port Finances
(million w)

	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
<u>Revenues</u>				
Collected by MOF	74.5			
Collected by MOT	<u>110.5</u>	<u>139.8</u>	—	—
Total	185			
<u>Expenditures</u>				
MOT (port operation and aids-to-navigation)	198	238		
MOC: harbor construction	506	2,730	1,596	2,786
dredging	256	625	618	1,051
maintenance	<u>25</u>	<u>45</u>	<u>42</u>	<u>62</u>
Total	985	3,638		

Source: MOT and MOC.

Dredging expenditures in 1968 include 50 million Won to be used by the newly established Dredging Corporation.

The 1967 and 1968 ORB figures are different for harbor construction and dredging:

	<u>ORB 1967</u>	<u>ORB 1968</u>
Major and small harbors	1,486	3,027
Dredging	454	1,051

Table 28

Steel Cargo Vessel Fleet Development
(1,000 GT as of the end of the year)

	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>Aug. 31 1967</u>
Number	54	54	60	60	61	66	89	83
Tonnage	108	106	103	104	119	147	219	301

Source: MOT.

Note: Unit tonnages vary widely. In 1965, 17 vessels had less than 500 GT capacity; 36 vessels, totalling 134,000 GT, had more than 1,000 GT capacity; 9 vessels, totalling 68,000 GT, had more than 5,000 GT capacity. While this fleet includes all sea-going vessels, the smallest ones may be engaged in coastal as well as in sea-going trade.^{1/} In addition, in 1965 the total cargo vessel fleet comprised 548 wooden steam cargo vessels, totalling 26,000 GT, all of them with a less than 300 GT capacity.

In 1965, 73% of the fleet (expressed in GT) was more than 15 years old. The fleet figures in the table do not include tankers. In 1965 the tanker fleet comprised 100 steel vessels with a total 13,000 GT capacity (one 5,200 GT tanker, all other tankers with a less than 800 GT capacity). In 1966, 4 tankers, totalling 4,500 GT, were added to the fleet for coastal navigation.

1/ Data for 1967, however, would concern sea-going vessels only.

Table 29

Share of National Fleet in Total Trade

(1,000 t)

<u>Import</u>	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>
Total	2,451	2,449	3,700	4,397	4,163	5,174	6,772
Crude oil					725	830	1,496
Total less crude oil	2,451	2,449	3,700	4,397	3,438	4,344	5,276
National vessel	412	529	755	878	901	1,197	1,473
%	17	22	20	20	26	23	22
<hr/>							
<u>Export</u>							
Total	582	964	803	862	1,061	1,577	1,663
National vessel	377	429	288	283	398	463	594
%	65	44	36	33	38	29	36

Source: From MOT data.

Table 30

Official Vessel Procurement Program

	1967			1968			1969		
	No.	Gross tonnage units (1,000 GT)	Cost (million US\$)	No.	Gross tonnage units (1,000 GT)	Cost (million US\$)	No.	Gross tonnage units (1,000 GT)	Cost (million US\$)
<u>Sea-going (Imported)</u>									
Freighters	26	126		21	103	31.7	9	128	
Tankers	2	29		21	103	31.7	7	421	
Total	28	155	22	21	103	31.7	16	549	175.3
Remarks	All second-hand ships already ordered. Down-payment is 10 to 20%, balance is due in 35 months. Foreign currency is obtained through BOK.			All new ships already ordered through commercial loans from Japan with guarantee of the Government. Terms of loans are 8 years and 5.5% interest.			Not yet ordered.		
<u>Coastal (Imported)</u>									
Freighters	18	24		2	7	2.1			
Tankers	15	20		2	7	2.1			
Total	33	44	4.1						
Remarks	All second-hand ships imported from Japan.			All new ships under construction in Japan.					
<u>Local Construction</u> (Steel ships)		14		50			62		

Sources: Sea-going and coastal: MOT. No import foreseen after 1969.
 Local construction: MCI. 1970 and 1971 forecasts are 50,000 and 55,000 GT.

Table 31

KSC Summary Income Statements
(million W, 1,000 US\$)

	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>
<u>Total Results Expressed in Won</u>						
Income	860	797	1,310	1,933	2,589	
Expenses						
Operating expenses			1,016	1,338	1,848	
Depreciation			63	108	210	
General Management and interest			193	199	212	
Total expenses	<u>779</u>	<u>776</u>	<u>1,272</u>	<u>1,645</u>	<u>2,270</u>	
Net profit (W)	<u>81</u>	<u>21</u>	<u>38</u>	<u>288</u>	<u>293</u>	
<u>Part of Results in Foreign Currency</u>						
Income	2,610	1,932	2,281	2,866	3,771	3,625
Expenses	<u>3,714</u>	<u>3,183</u>	<u>2,997</u>	<u>3,362</u>	<u>4,616</u>	<u>6,268</u>
Net profit (\$)	<u>-1,104</u>	<u>-1,251</u>	<u>-716</u>	<u>-496</u>	<u>-845</u>	<u>-2,643</u>
<u>Assets</u>						
Current assets	635	641	563	1,077		
Fixed assets	<u>368</u>	<u>2,740</u>	<u>1,886</u>	<u>1,221</u>		
Total assets (w)	1,003	3,382	2,450	2,298		
(Exchange rate: 1 US\$ = W)	130	130	255	270	270	

Source: MOT.

Table 32
1971 Coastal Fleet Requirement

	Traffic 1966		Traffic 1971		Tonnage required 1971		Tonnage on hand 1966		To be procured SFYP		Procured or ordered in 1967
	million t	million tkm	million t	million tkm	GT	DWT	DWT	DWT	DWT	DWT	
Coal	1.14	400	2.00	700	18,000	26,000	7,500	18,500		(8,000)	
Cement	-	-	1.60	560	14,500	21,000	0	21,000		(11,300)	
Ore	-	-	0.25	75	2,000	3,000	0	3,000		-	
Other dry	0.58	60	0.99	100	5,000	7,500	-	-		-	
Total dry	1.72	460	4.84	1,435	39,500	57,500	-	-		-	
POL	0.57	155	6.50	2,600	50,000	70,000	18,500	52,500		(29,000)	
Total	2.29	615	11.34	4,035	89,500	127,500	-	-		-	

Source: Mission.

Table 33

Air Traffic

	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>Jan.- August 1967</u>
Passengers - domestic (000)	47.9	94.0	174.9	207.7	191.6 (151.5)	
Passengers - international (000)	37.4	48.8	60.7	77.5	131.4 (108.9)	
Total (000)	85.3	142.8	235.6	285.2	323.0 (260.4)	
Annual increase rate - domestic	96%	85%	19%	-8%		
Annual increase rate - international	31%	24%	28%	70%		
Annual increase rate - total	68%	65%	21%	13%		
Load factor - Domestic KAL	60.1	58.9	60.4	63.5	68.0 (60.0)	
KAL share in international	0%	0%	8%	14%	20% (18%)	
Number of flights - domestic	3,240	5,275	9,508	10,491	9,566 (6,776)	
Number of flights - international	921	912	1,448	1,881	2,327 (2,153)	
Annual increase rate - domestic	63%	80%	10%	-9%		
Annual increase rate - international	-1%	60%	30%	24%		

Source: from MOT data.

Table 34

Airport and Navaid Investments

(million W)

	<u>1966</u>	<u>1967</u>	<u>1968</u>
Kimpo	109.8 ^{1/}	73	204
Pu San ^{2/}	22	25	31
Je Ju ^{3/}			75
Other existing airfields ^{4/}	56.9		44
New airfields ^{5/}		74	70
Aviation college			13
Safety equipment (AID loan)		191	540
Total	188.7	363	977

1/ Includes safety equipment.

2/ Taxiway and apron pavement.

3/ Terminal and runway pavement.

4/ 1968: terminal and taxiway and apron pavement in Gang Reung.

5/ Jeon Ju, Mog Po, So Ruk, Yeo Su.

Sources: MOT and 1967 and 1968 ORBs.

Table 35
KAL Income Statements
(1,000 US\$)

	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>
Operating revenue	896.6	2,052.0	2,264.5	4,052.7
Operating expenses	<u>956.6</u>	<u>1,877.3</u>	<u>2,024.2</u>	<u>3,661.0</u>
Operating result	-59.9	174.7	240.3	391.8
Non-operating result	96.0	-140.8	-104.0	-126.3
Current net profit	36.1	33.9	136.3	265.5
Current assets	1,256.8	1,711.3	1,098.2	1,288.0
Fixed assets	2,537.9	1,899.2	2,662.7	3,337.3
Other	62.8	46.8	68.4	199.4
Total assets	<u>3,857.5</u>	<u>3,657.3</u>	<u>3,829.3</u>	<u>4,824.7</u>

Source: MOT.

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