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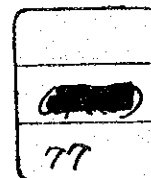
FEASIBILITY AND PRELIMINARY ENGINEERING  
STUDY OF ROAD PROJECT EL OBEID-UM RUABA  
IN KORDOFAN PROVINCE SUDAN

INCEPTION REPORT

MARCH 1977

415  
614  
SDF

JAPAN INTERNATIONAL COOPERATION AGENCY





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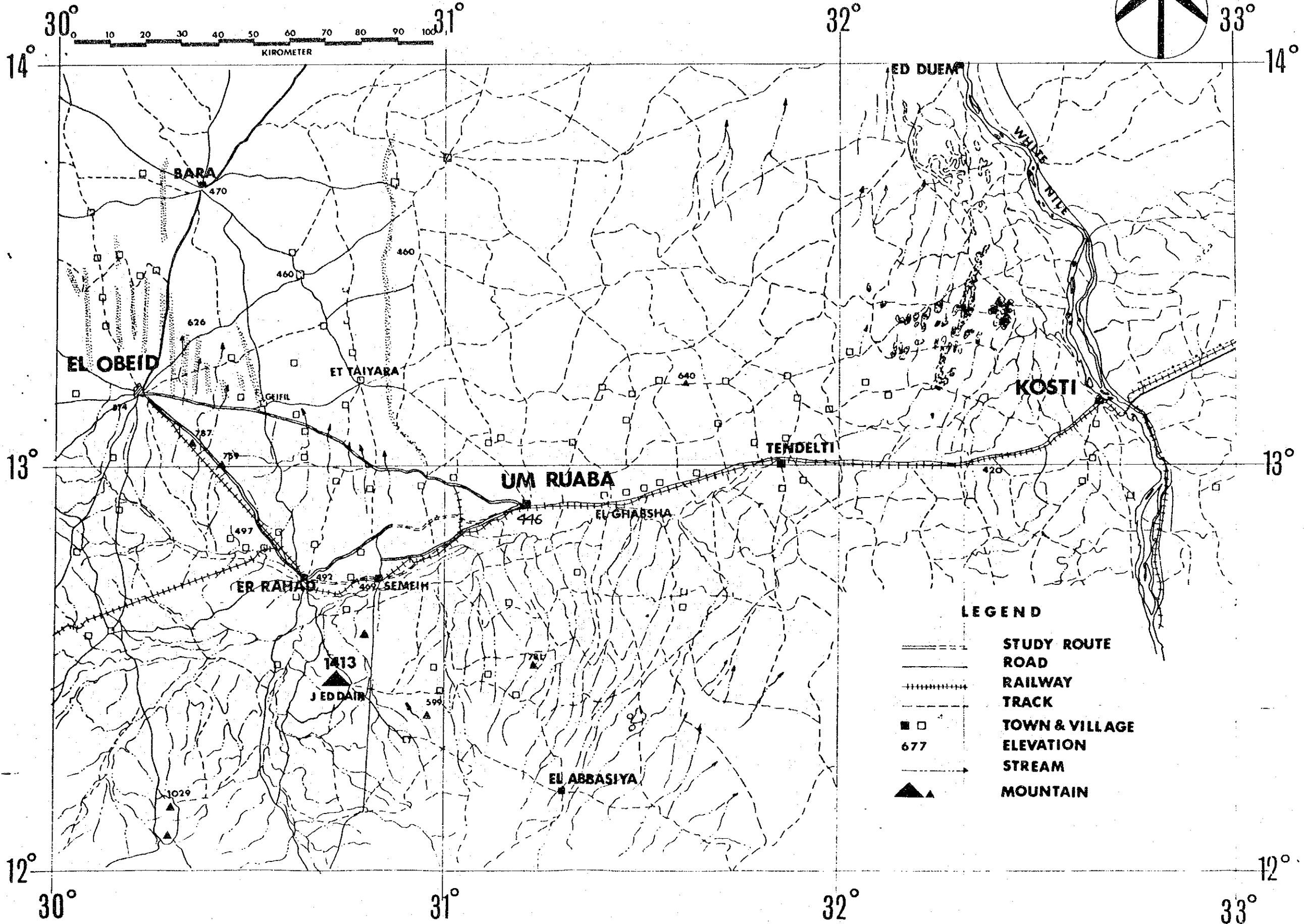
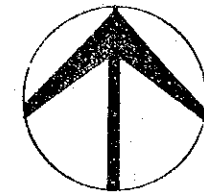
MARCH 1977

JAPAN INTERNATIONAL COOPERATION AGENCY

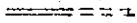
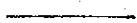





国際協力事業団	
受入 月日 84.09.25	415
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# LOCATION MAP OF UM RUABA - EL OBEID ROAD FEASIBILITY STUDY



## LEGEND

-  STUDY ROUTE
-  ROAD
-  RAILWAY TRACK
-  TOWN & VILLAGE
-  ELEVATION
-  STREAM
-  MOUNTAIN



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## Preface

This feasibility study will be conducted by the Government of Japan as a technical cooperation to ADB/ADF and the Government of Republic of the Sudan. On behalf of the Government of Japan, the study will be undertaken by the Japanese International Cooperation Agency (JICA). The JICA sent a technical preparatory mission to Sudan and ADB/ADF in November 1976 to prepare the terms of reference and the Scope of Work of the study. In response to the TOR and SW, the study proposal is prepared by a team of consultants selected by JICA.



## Chapter I. The Objective

The objective of the study is to propose the best plan of improving the road between El Obeid and Um Ruaba of approximately 150 km in length, which is a section of the Sudanese east-west highway. The conclusion will be the presentation of the preliminary designs of the road for improvement, which is derived through economic assessment in comparison with other alternatives.



## Chapter II. The Scope of the Study

### 1. Plans of the Study

The study will be divided in two stages; the first stage is to determine a corridor in which major surveys will be conducted, while the second stage is scheduled to perform surveys in engineering and economy to select the best improvement plan in this corridor.

#### 1.1. The first stage

(1) By reviewing other development studies and plans, and through discussions with the governmental staffs, the mission will recognize the importance of the project road in the development of regional and national economy.

(2) Reconnaissance survey is scheduled at the beginning weeks of the study on alternative corridors between El Obeid and Um Ruaba. A corridor in which the main studies will be concentrated should be selected by comparing the effects of the project on the following factors.

- a. Social and economic activities along the corridor
- b. Geometric and soil conditions
- c. Accessibility to the new road from the towns along the existing roads
- d. Association with development plans in other





sectors, etc.

The selected corridor will be presented to the Sudanese Government for approval, then the result will be reported to ADB/ADF and JICA as well.

#### 1.2. The second stage

On the corridor being selected, alternative improvement plans should be developed through the studies in the following fields:

- (1) Survey will cover such works as aerial photography and ground surveys, soil, material, hydrology, structures, traffic flows, prices and costs, and regional economy.
- (2) Using produced map at 1:5,000, preliminary drawings and bill of quantities will be presented. Their unit prices will also be estimated. Economic benefits of the project will be estimated as in the savings of the road users cost and in the additional products of the regional economy.
- (3) Conclusion will be presented as a result of comparing the alternative plans of improvement.



## 2. Notices

(1) When the team encounters unexpected situation where the continuation of the work seems to be difficult, the team should report the position to the Sudanese Government and JICA to receive suggestion for immediate action.

(2) The team will report the status of progress of the study to the organizations indicated by JICA.

(3) When the team finds it possible to subcontract with local firms in surveying, boring, and other works necessary for the execution of the study, the drafted contracts with them will be sent to JICA for approval.

(4) The team will pay due attention to have close contact with the RBPC and other Sudanese offices through the counterpart staff, and also provide sufficient opportunities for the counterpart staff to join in the process of the study.

## 3. Comments on TOR and SW

The TOR and SW is well prepared so that the team will be able to set up a work programmes as in the proposal.

There are some comments on TOR and SW as follows.

(1) The scale of the mapping is suggested either 1:5,000



or 1:10,000. Since the cost differential is estimated only UA 10,000 (yen 3,500,000), the team proposes to have a scale of 1:5,000. As a result, more precise quantities will be estimated.

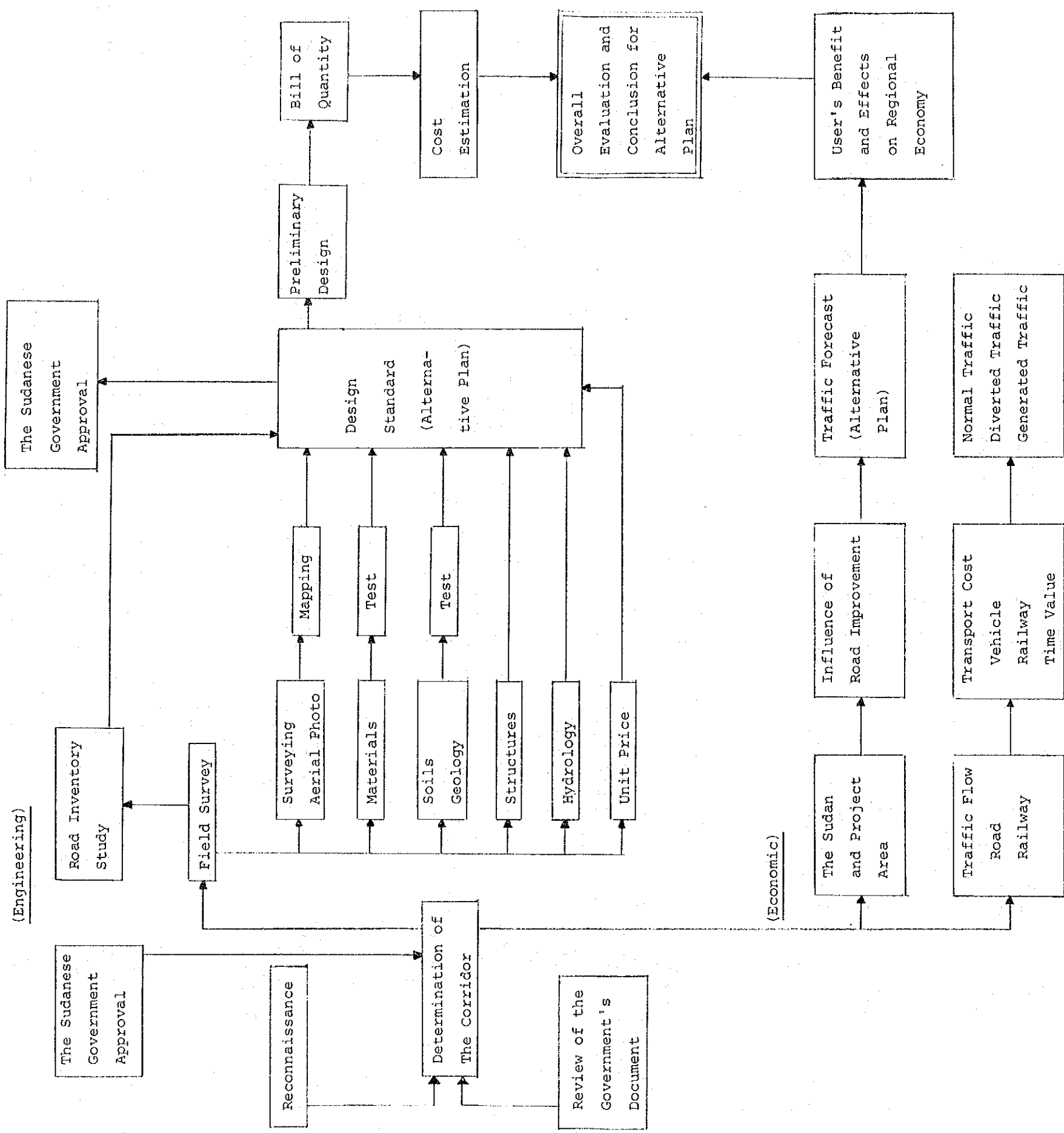
(2) An office will be prepared in Khartoum by RBPC. The team will need an office in the project site also. The team expects JICA will confirm the availability of an office with adequate equipment, in El Obeid before the team goes to Sudan.







FLOW CHART





## 1. Mobilization

The team will enter the project area by several groups. The first group will arrive at Khartoum Airport on March 19, 1977, and will prepare for the start of the study. The second composed of senior staff will enter the capital late in March. They will immediately join in the survey of the corridor-selection between El Obeid and Um Ruaba. The last group will arrive early May, 1977. Attached Table 1 shows the working schedule in Sudan.

## 2. The Corridor Determination

In the beginning weeks of the study, the team will survey the southern and northern corridors, and their access roads to determine a corridor in which the surveys should be conducted. The method of selecting a route at this stage is, not by rigorous engineering and economic comparison, but by preliminary review and judgement of all technical factors and social and economic influences of the project in the regional development.

The findings and comparison will cover the items as follows:

- (1) Geometric and soil conditions
- (2) Social and economic activities along the routes
- (3) Accessibility to the project road.



- (4) Association with other development projects in the area

The determined route after these findings will be presented to the directors of RBPC for consultation and agreements. The result will be immediately reported to ADB/ADF through JICA.

### 3. Road Inventory Survey

The existing condition of the roads between El Obeid and Um Ruaba will be studied and the result will be recorded in tables and maps. The items to be studied are shown as follows:

- (1) Right of way
- (2) Structures and engineering works
- (3) Curvatures
- (4) Gradients
- (5) Soil types
- (6) Streams and courses
- (7) Any limitations on improvements
- (8) Surface conditions
- (9) Traffic pattern, etc.

### 4. Engineering Study

#### 4.1. Aerial photography and strip maps



Since it is suggested by JICA to prepare a map of the scale at 1:5,000, the team proposes to take photographs at 1:25,000 in the width of 5 km and do necessary ground surveys along the route selected. The pictures at the scale of 1:25,000 will be printed immediately in Khartoum for the uses in field surveys by the engineers. The strip maps at 1:5,000 for the width of 1 km selected from the range of 5 km will be developed in Japan later.

It is understood that necessary services and facilities for these works will be given by the Sudanese Government provided the cost agreed in advance is paid by the team. It is also understood that the Sudanese Government will authorize the sending of negative films to Japan under the supervision of JICA for developing the maps. The negative films will be sent back immediately to Sudan after its use.

#### 4.2. Materials

According to the transport study by ADAR in 1976 and a reconnaissance trip by the JICA's preparatory mission in November 1976, it is likely that there are no quarries adjacent to the existing road since project area is mostly covered by QOZ (sand dunes). The team will survey the existence of quarry around the area, and if endorsed quarries are found, the team will estimate its volume. The qualities of samples will be analysed by using a





"handy elastic wave velocity measurement" and applying "abrasion test".

If it is confirmed that there are no necessary materials available at reasonable cost in the surrounding area, an alternate plan should be explored. This will be "the stabilization of local materials" by adding cement, asphalt, etc. Laboratory test is scheduled to find out satisfactory mixture effect.

#### 4.3. Soils

The Sudanese geological map shows that the project area is covered by QOZ (sand dunes) mostly. The route may pass through the clay area near El Rahad. The soils will be sampled and tested from the spots located every 20 km along the route. At each site these tests are scheduled:

- (1) in site: C.B.R. test
- (2) in the laboratory: Soaked C.B.R. test  
Classification and  
identification test

It is informed that there are two submerged bridges along an existing route. The boring work will be done at the places where structures are located including the existing submergible bridges, provided boring machine could be mobilized locally. The work will include "standard



penetration test" and identification of subsoil condition.

#### 4.4. Hydrology

It is informed in TOR that annual rainfall is 400 - 500 mm in the area. The rainy season comes late June up to September.

In the project area, the discharge will be studied by observing flood mark and vegetation and by questioning to the local people. Statistical data of rainfall, etc. will be gathered.

Water will be used for the compaction of road bed and other works. The team will study the availability of ground water, the possibility of dam construction and other methods.

#### 4.5. Structures

There are two irish bridges on the existing road, and two small railway bridges near these crossings. Other structures and standards of railways will give valuable information for the engineering of road structures. Bridges, boxes culvert, corrugated pipes, side ditches, fences etc. will be studied.



#### 4.6. Alignment, preliminary designs and bill of drawings

##### (1) Alignment

A plan of alignment in the determined route will be developed after the field surveys and tests.

##### (2) Design standards

Design standards will be prepared after these surveys and taking into account the standards applied to the similar roads in Sudan.

An alignment plan together with the proposed design standards will be presented to the directors of RBPC for their approval.

a. Geometric standards

b. Pavement design

c. Structures

##### (3) Drawings

The scale of drawings will be as follows, subject to the approval by the directors of RBPC.

a. Plan 1:5,000

b. Profiles H 1:5,000

V 1:500

c. Typical cross sections 1:100

d. Structures 1:100 or 1:50



It is expected the approval of the alignment plan and preliminary design standards will be suggested when the team leaves out Sudan in June 1977. The result will be reported to ADB/ADF through JICA.

#### 4.7. Bill of quantities

Quantities of the work will be developed and summarized in a table with items divided into as follows:

- (1) Clearance
- (2) Earthworks
- (3) Slope protection
- (4) Pavement
- (5) Drainages
- (6) Structures
- (7) Land aquisition

#### 4.8. Cost estimate

Actual cost of similar road works will be provided by RBPC, which should be used as a reference of the cost estimate. Unit cost will be estimated for each item in the bill of quantities as follows:

- (1) local and foreign currency component
- (2) with and without taxes and duties

Other items such as contingencies, consultant's fee for detailed engineering and for work supervision will be





estimated. The difference of the cost between the contractor system and the RBPC direct work system will be studied.

#### 4.9. Maintenance cost

Road maintenance cost will be estimated by taking into account the maintenance system of RBPC and its expenditures. The cost will be divided into the items similar to (not exactly) those in construction cost.

### 5. Traffic Study

#### 5.1. Survey stations

Traffic surveys will be carried out at station on the following road-sections:

- (a) Um Ruaba - Rahad
- (b) Rahad - El Obeid
- (c) Um Ruaba - El Obeid
- (d) El Obeid - Bara

#### 5.2. Traffic surveys

- (a) Origin and destination survey

At each station above, traffic will be stopped and drivers will be interviewed. O-D survey will be carried out for 2 or 3 days continuously.



(b) Manual count

Vehicles will be counted at each station for 7 days continuously. They will be classified by types and number of axles will be recorded.

(c) Seasonal variation

Traffic will change seasonally because of rain, harvest, market, etc. These changes will be disclosed by studying traffic data kept by RBPC.

## 6. Economic Study

### 6.1. Regional economy

#### (1) Zoning

The zones of influence will be determined in the project area as follows.

(a) Each urban center such as El Obeid, Um Ruaba, El Rahad will be delineated as a zone in the direct influential area.

(b) The corridor between El Obeid and El Rahad will be divided into two or three segments with the width of approximately 10 km on either side of the road. Also between El Rahad and Um Ruaba the strip will be delineated into two or three zones similarly.



(c) The project road will have indirect influential zones. They are delineated beyond the direct influential zones mentioned as (a) and (b).

The zones of indirect influence will cover the area such as western Kordofan, Darfur, Nuba mountain area, and Kosti with eastern provinces.

(2) Economy, present status and future

In the zones of influence economic activities, such as production, marketing, transportation will be studied by gathering the statistics, meetings with local officers and peoples and studying cultivated area and livestock. The team will also approach to the development plans in the zones to know their objectives, costs, plans of implementation, etc.

In the secondary influential areas, economies will also be studied. Specifically part of the movement of goods and passengers to and from these regions are passing through the project area. The volumes and modes of transport are the subject of our attention. Prospect for future growth of these regions will be studied also by reviewing past trend and development plans as well.

The analysis of these economies together with the national economy will be the basis of the estimate of traffic growth on the project road.



## 6.2. Traffic estimate

### (1) Normal traffic

The traffic study, as proposed in Section 5, will present the flows of vehicles together with goods and passengers for each section of the roads. The growth of the traffic will be estimated by considering the following factors:

- a. Economic growth of the region which is analysed in the Sect. 6.1. above.
- b. Vehicle production and import policy of the country.
- c. Changes in registered vehicles and their types.
- d. Changes in the movement of goods and passengers on the railroad which runs in parallel with the road.

### (2) Diverted traffic

The railway parallel to the project road is transporting goods and passengers. The operation of the present system and the improvement plan will be studied. The possibility of diversion to road transport services will be analysed by comparing the services and cost.

### (3) Development traffic and induced traffic

The project road will stimulate the movement of goods and persons by providing better facility with reduced cost, which in turn will support the economic growth in the region.





If additional traffic volume is estimated either as induced or developmental traffic, this volume will be presented as additional traffic.

### 6.3. Transport cost

#### (a) Vehicle operating cost

The traffic survey will show the representative types of vehicles on the roads. The running cost of these vehicles will be revealed in terms of financial cost and economic cost on different surface types.

#### (b) Time value

Economic value of time can be estimated when an improvement in transport system result in savings in time which can be utilized in other economic activities. The team will determine the value of time if saved time can be utilized for the economy in the region.

#### (c) Railway cost

The team will study the cost of railway operation. The difference of transport cost between rails and roads will support the estimates of traffic diversion and savings in transport cost. The differences among the user's cost, financial cost, and economic cost of railways will be identified.



## 7. Evaluation

### 7.1. Economic assessment

In the selected corridor between El Obeid and Um Ruaba, alternative construction plans will be developed each with estimated economic cost. Each plan will have maintenance costs for the years of project life.

The economic benefits is composed of the savings in transport cost of the road users which will be realized with the completion of the project. If it is considered realistic to add up the development benefit being generated by the road improvement, care should be taken not to count in double with other benefits. The benefits will be estimated for each year during the life of the project.

The streams of costs and benefits will be developed to produce the following figures which will be used to compare the alternative plans.

- a. The first year benefit cost ratio
- b. Cost benefit ratio
- c. Net present worth
- d. Internal rate of return

### 7.2. Sensitivity analysis



The ranges of variation of B.C figures should be confirmed by applying "sensitivity analysis", since there are uncertain and unknown factors which will influence the estimation of costs and benefits. The use of shadow prices will be an item to be covered by this analysis.

### 7.3. Unquantified effects

If there are effects and benefits besides the economic benefits, they should be mentioned qualitatively rather than quantitatively.

### 7.4. Conclusion

The best optimized investment plan is selected from the alternative plans analysed in the study. It will be presented as the conclusion of the study. Recommendation may be attached if it is found necessary.



Work Schedule in Sudan

	March	April	May	June	Main Works
Team Manager					Management
Economist					Economy, Traffic
Agronomist					Agriculture, Livestock
Traffic Engineer					Traffic
Road Engineer I					Road, Structure
" II					Road, Soils, Lab-test
" III					Road, Cost
Hydrologist					Hydrologic
Geologist					Materials, Soils
Cost Accountant					Road, Cost
Surveyer I					Aerial Photos, Ground Surveys
" II					" " " "

Table - 1





TIME SCHEDULE OF THE STUDY

## 1. Contract between JICA and Consultants

March 1, 1977

## 2. Mobilization

(Inception Report : 5 copies each to Sudan and ADB,  
10 copies to JICA.)

<u>Arrival</u>	The first party	March 19, 1977 in Sudan
	The last party	May 4, 1977 "

(Progress Report I : 5 copies each to Sudan and ADB,  
10 copies to JICA. Late April, 1977)

<u>Departure</u>	The first party	May 27, 1977 from Sudan
	The last party	June 18, 1977 "

(Progress Report II : 5 copies each to Sudan and ADB,  
10 copies to JICA. Mid June, 1977)

## 3. Home Works

June, 1977 to March, 1978

(Interim Report : 5 copies each to Sudan and ADB,  
10 copies to JICA. Late Sept., 1977)

Comments on Interim Report : by late Sept., 1977

(Draft Final Report : 5 copies each to Sudan and ADB,  
10 copies to JICA by late Jan., 1978)

Comments on Draft : by late Jan., 1978

(Final Report : 20 copies to Sudan,  
5 copies to ADB, and  
35 copies to JICA by late March, 1978)

Notes: All reports are written in English.



## Chapter IV Member of Mission

### 1. Name and Title

<u>Name</u>	<u>Title</u>
Noritomo Okuda	Team Leader
Teruhiko Horie	Deputy Team Leader and Transportation Economist
Masae Yamazaki	Agro-Economist
Kunio Taniguchi	Cost Estimator
Harumi Nishikawa	Chief Highway and Structural Engineer
Shizuo Iwata	Traffic Engineer
Takeshi Tomiyasu	Highway and Soil Engineer
Kunio Ohashi	Coordinator
Masataka Miyagawa	Hydrological Engineer
Ryuichi Ichihara	Quarry and Geological Engineer
Yoshiaki Otoku	Chief Surveyor
Mikio Kurita	Surveyor



March, 1977

## 2. Curriculum Vitae

1. Name: NORITOMO OKUDA (Team Leader)
2. Home Address: 2-15-23, Eifuku, Suginami-Ku, Tokyo, Japan.
3. Date of Birth: October 10, 1910.
4. Nationality: Japan
5. Education: 1935, Civil Engineering Dept, Tokyo University.
6. Membership: The Japan Society of Civil Engineers.,  
Japan Road Association., Japan Consulting Engineers Association.
7. Language: Japanese and English
8. Professional Experience:
  - 1969 - at Present Executive Managing Director, Mitsui Consultants Co., Ltd.
  - 1962 - 1969 Director, Teito Rapid Transit Corporation.
  - 1961 - 1962 Engineering Counselor, Ministry of Construction.
  - 1953 - 1961 Served again with Ministry of Construction, Section of City Construction.
  - 1952 - 1953 Chief of Planning Section, Hiroshima Prefecture.
  - 1949 - 1952 Served with Ministry of Construction.
  - 1945 - 1949 Served as a Member of the Headquarters Staff, Ministry of Home Affairs.

## 9. Major Studies Performed in Foreign Countries:

- 1975 - 1976  
Indonesia Feasibility Study Team Leader of Road Betterment Project in Central & East Java, Indonesia.
- 1973 Iran Preliminary Study of New Town Construction Plan for Bander-e-Shapur Industrial Complex, Iran.
- 1971 - 1975  
Indonesia Survey Team Leader of the Highway Rehabilitation Project, North Sumatora and Central Java, Indonesia.
- 1950 Cambodia Survey and Preliminary Study of the Resort City at Kililom, Cambodia.

## 10. Domestic Major Studies in Recent Years:

- 1976 Elevated Railway Plan at Near Around Tokushima Station.
- 1976 Design of Hatoyama New Town Construction Plan, Saitama Prefecture.
- 1975 Disaster Prevention Plan for the Foot of Rokko Mountain.



- 1974 Development Plan for Near Around Mito Station Area.
- 1973 Preliminary Study & Design of Yuheisen Area Development Plan, Akita Prefecture.
- 1972 - 1975 Plan & Design of Sagami Industrial Park, Kanagawa Prefecture.
- 1963 - 1968 Improvement & Route Selection Works of Subway Network in Tokyo.
- 1960 - 1961 Basic Plan of Hanshin Highway Network.
- 1956 - 1957 Basic Plan of Tokyo Metropolitan Highway Network.





March, 1977.

1. Name: TERUHIKO HORIE (Deputy Team Leader and  
Transportation Economist)
2. Home Address: 14-17, 4-chome, Kitazawa, Setagaya-ku, Tokyo
3. Date of Birth: June 21, 1932
4. Nationality: Japan
5. Education: 1955 B.A. in Economics, Political Science  
and Economics Dept., Waseda University,  
Tokyo, Japan  
  
1969 M.S. in Economics, Graduate School,  
Texas A.M. University, College Station,  
Texas, U.S.A.
6. Membership: The Japanese Society of Transport Studies  
  
The Society of Environmental Information  
Science
7. Language: Japanese and English
8. Professional Experience:  
  
1976 - at Present Senior Economist in the Projects Study  
Division, KCS Consultants, Co., Ltd., Tokyo  
  
1974 - 1976 Transport Economist, Operations Department,  
African Development Bank, Abidjan,  
Ivory Coast  
  
1972 - 1974 Senior Economist, Transport Study Division,  
IBS Research Institute, Tokyo, Japan  
  
1972 Highway Economist, Transport Projects  
Department, IBRD, U.S.A.  
  
1969 - 1972 Economist, Transport Study Division, IBS  
Research Institute, Tokyo, Japan  
  
1961 - 1967 Chief, Economic Study Division, Nippon  
Business Consultant Co., Ltd., Tokyo, Japan
9. Major Studies Performed in Foreign Countries:  
  
1974 - 1976 African Countries As a Transport Economist of African  
Development Bank, I reviewed the  
feasibility studies and appraised  
projects in transport sector.  
The countries I visited for appraisal  
are Gambia, Liberia, Botswana, Zambia  
Kenya, Somalia and Ethiopia.



1974	Bolivia	Under the contract with JICA, I joined in the feasibility study team of roads construction project.
"	Indonesia Malaysia Thailand Phillipines	Reviewing the development programme of infrastructure in these countries, I presented recommendations to the Japanese Government in what part or sector the Government should cooperate. (Home works only)
1971	Caribbean Countries	As a highway economist of IBRD, I reviewed the feasibility studies and appraised road projects. The countries I visited are Trinidad Tobago and Guiana.

10. Domestic Major Studies in Recent Years:

1973		Economic evaluation of transport programmes in the large Tokyo urban area (a case study)
"		Estimate of future growth of transport demand in Sendai urban area.
1972		Economic evaluation of Saga Bypass
"		Analysis of vehicles diversion to the tolled motorway between Tokyo and Osaka.
1971		Systems analysis of urban commuter transport development plans.
1970		Financial analysis of the Nationwide tolled motorway network plan.
"		Studies of the use of private passenger cars on holidays.
1967		Analysis of vehicles diversion to the tolled Osaka - Nagoya Highway.
1966		Feasibility study of Nishi-hiroshima Bypass route construction plan.
"		Origin and destination survey of the vehicles on the roads between Osaka and Nagoya.
1965		OD survey of the vehicles in the Hiroshima urban area.
"		OD survey of vehicles in Kanto (including Tokyo) area and the analysis of their uses.
1964		Estimate of traffic growth in the Hachinoe area, including the OD survey of vehicles.



March, 1977.

1. Name: MASAE YAMAZAKI (Agro-Economist)
2. Home Address: 11-463, 2-chome, Kokubungi-shi, Tokyo, Japan
3. Date of Birth: February 3, 1915
4. Nationality: Japan
5. Education: 1935 Agronomy course, College of Agriculture, Utsunomiya University,  
Professional Registration: Qualified as Agricultural Extension Specialist on Rice, Ministry of Agriculture and Forestry of Japan, 1949 and as Specialist Researcher for Agronomy, Ministry of Agriculture and Forestry of Japan, 1953
6. Membership:
7. Language: Japanese and English
8. Professional Experience in Agronomy:

1974 - at Present	Director AICO (Agro-Industrial Complex Inc.)
1973 - 1974	Advisor on Agronomy to AICO
1972 - 1974	Member of the Science Council of Japan
1969 - 1972	President of the Director's Society of the Prefectural Agricultural Experiment Stations of Japan
1967 - 1972	Director of Tokyo Metropolitan Agricultural Experiment Station
1965 - 1967	Director of Agricultural Extension Service, Tokyo Metropolitan Government
1959 - 1962	Chief of Grop Cultivating Technique Research Division, Tokyo Metropolitan Agricultural Experiment Station
9. Major Studies Performed in Foreign Countries:

1975	Middle East	Studied and reported on the Regional Development of Arid Region in the Middle East to JICA (Japan International Cooperation Agency)
1974	Vietnam	As a Member of Agricultural Study Team sponsored by the Asian Development Bank, studied cropping pattern and pilot farm management for TAN AN Project in Vietnam



- |      |                      |  |
|------|----------------------|--|
| 1973 | United Arab Emirates | Studied the Feasibility of Agricultural Development in the Desert of Abu-Dhabi Emirate,  |
| 1960 | U.S.A.               | Participant of Agricultural Experiment and Research Coordination Team for Inspection of Administration and Coordination of Agricultural Research |

10. Domestic Major Studies in Recent Years:

- |             |   |
|-------------|---|
| 1972        | As a Member of the Science Council of Japan, participated in the Promotion of International Intercourse and Science   |
| 1967 - 1972 | Administered and Coordinated the Agricultural Experiments and Research in Tokyo Metropolitan Area. Since 1969 to 1972, as the President of the Agricultural Experiment Station Director's Society of Japan, led and promoted the Prefectural Agricultural experiments and Researches. |
| 1965 - 1967 | Served as the Director of Extension Service for Agricultural Extension Service in Tokyo   |
| 1952 - 1965 | Directed the Agricultural Management Studies and Marketing Researches in Tokyo.   |
| 1957        | Published the Studies on the Depression of Upland-rice caused by continuous cropping.   |





March, 1977.

1. Name: KUNIO TANIGUCHI (Cost Estimator)
2. Home Address: 58, Gakuto, Komae-City, Tokyo.
3. Date of Birth: January 9, 1915.
4. Nationality: Japan
5. Education: 1938, Civil Engineering Department, Kyoto University.
6. Membership: The Japan Society of Civil Engineers.
7. Language: Japanese, English, German and Malay.
8. Professional Experience:
  - 1977 - at Present Managing Director of Mitani Engineering Co., Ltd.
  - 1961 - 1976 Director of Engineering Department, Kajima Road Co., Ltd.
  - 1947 - 1960 Yubetsu Coal Mine Co., Ltd.
  - 1938 - 1946 ,Mitsubishi Metal Mine Co., Ltd.
9. Major Studies Performed in Foreign Countries:
  - 1971 Indonesia Cost Estimation Works for Road Construction in Sumatora, Indonesia.
  - 1970 Indonesia Cost Estimation Works for Road Construction in East Kalimantan, Indonesia.
  - 1966 Thailand Supervision Works for Road Construction in Thailand.
10. Domestic Major Studies in Recent Years:
  - 1974 Supervision Works for Misawa Air Port Const-  
ruction.
  - 1972 Supervision Works for Kisozaki Bank Revet-  
ment Construction.
  - 1967 Supervision Works for Tomei Highway Construct-  
ion,
  - 1964 Supervision Works for Meishin Highway Const-  
ruction.
  - 1963 Supervision Works for Aso Highway Construction.



March, 1977

1. Name: HARUMI NISHIKAWA (Chief Highway and Structural Engineer)
2. Home Address: 16-6-101, Shirane Asahi-ku, Yokohama-shi, Asahi-ku, Kanagawa Prefecture, Japan
3. Date of Birth: September 5, 1937
4. Nationality: Japan
5. Education: 1961 B.E. in Department of Civil Engineering College of Science and Technology, Kyusyu University, Fukuoka, Japan
6. Membership:
7. Language: Japanese and English
8. Professional Experience in Civil Engineering:
  - 1967 - at Present Civil Engineer, Road and Traffic Division, Mitsui Consultants Co., Ltd.
  - 1961 - 1966 Civil Engineer, Bridge and Structure Division, Yachiyo Engineering Co., Ltd.
9. Major Studies Performed in Foreign Countries:
  - 1975 Tanzania Feasibility Study on Southern Coastal Link Road Project for Japan International Cooperation Agency
  - 1973 - 1974 Bangladesh Feasibility Study on Jamuna Bridge Project for Japan International Cooperation Agency.
10. Domestic Major Studies in Recent Years:
  - 1976 Feasibility Study on Southern Coastal Link Road Project for Japan International Cooperation Agency
  - 1973 Detailed Design of Rufiji Bridge Project (Tanzania)
  - 1971 Detailed Design of Tohoku Expressway at Shiwa Section
  - 1970 Detailed Design of Hokuriku Expressway at Toyama Section
  - 1969 Alternative Design of Tohoku Expressway at Motomiya Section



March, 1977.

1. Name: SHIZUO IWATA (Traffic Engineer)
2. Home Address: Flower Home 903, 5-19-5, Hiroo, Shibuya-Ku, Tokyo, Japan.
3. Date of Birth: September 1, 1942
4. Nationality: Japan
5. Education: 1966 B.S. in Civil Engineering, Waseda University, Tokyo, Japan
6. Language: Japanese, English and German
7. Membership: City Planning Agency of Japan
8. Professional Experience:
  - 1969 - at Present ALEA Corporation
  - 1966 - 1969 Pacific Consultants International
9. Major Studies Performed in Foreign Countries:

1974 - 1975	Zaire	Full-scale feasibility study of the 700 km long section which forms a part of Trans African Highway linking Mombasa in Kenya and Lagos in Nigeria, a project sponsored by JICA.
1975	Nigeria	Engaged in the comprehensive regional development survey for the State of Rivers in Nigeria.
"	Peru	Feasibility study for improvement of existing national trunk road No. 8 in connection with Michiquillay mining devevelopment, a project sponsored by JICA.
"	Sarawak	Highway pre-feasibility study and related economic studies for the State of Sarawak, Malaysia under auspices of SEATAC (Southeast Asian Agency for Regional Transport and Communications Development) based in Kuala Lumpur.
1974	Brazil	Preliminary regional development study for the Island of Garuja located in the Sao Paulo Region, a project sponsored by ECFA.



- |      |                                      |  |
|------|--------------------------------------|--|
| 1974 | Western Samoa<br>Kingdom of<br>Tonga | Economic feasibility study for the development of Faleolo Airport in Western Samoa and for the development of an international airport in the Kingdom of Tonga, a project sponsored by UNDP/ICAO.                  |
| 1973 | Bangladesh                           | Economic feasibility study with particular reference to transport system for construction project of Jamuna River Bridge, a project sponsored by Overseas Technical co-operation Agency of Japan                   |
| 1972 | South Pacific<br>Ocean               | Preliminary survey on the leisure and recreational resources in the Islands of South Pacific Ocean (Tahiti, Tonga, W. Samoa, Fiji, New Hebrides, Solomon Island, Nauru, Majuro, Mariana Islands, the Philippines). |

10. Domestic Major Studies in Recent Years:

- |             |   |
|-------------|---|
| 1972        | Setting up master plan of the proposed New Town development in the Iga Ueno district covering an area of approximately 1,000 ha.  |
| 1970 - 1971 | Engaged in highway transportation study which is a part of Regional Transport Survey under auspices of Asian Development Bank based in Manila, Philippines, covering Indonesia, Malaysia, Singapore, Thailand, Vietnam, Laos and Philippines. |
| 1970        | Setting up land use plan for the surrounding area of the New Tokyo International Airport.   |
| 1969        | Setting up master plan of the proposed industrial estate (430 ha) in Fukushima Prefecture   |
| "           | Setting up of the development plan for the area surrounding the New Tokyo International Airport.  |





March, 1977.

1. Name: TAKESHI TOMIYASU (Highway and Soil Engineer)
2. Home Address: 5-203, Sonnoh-danchi, Sonnoh-cho, Chiba-shi, Chiba,
3. Date of Birth: August 13, 1940
4. Nationality: Japan
5. Education: 1965 Civil Engineering Course, Technology Department, Kumamoto University, Kumamoto, Japan
6. Membership: The Japan Society of Civil Engineers.  
The Japanese Society of Soil Mechanics and Foundation Engineering
7. Language: Japanese, English and Indonesian
8. Professional Experience:  
1966 - at Present Highway engineer, Road and Traffic Division, Mitsui Consultants Co., Ltd.  
1965 - 1966 Highway Engineer, Civil Engineering Works Section, Fukuoka Branch Office, Mitsui Consturciton Co., Ltd.
9. Major Studies Performed in Foreign Countries:  
1975 - 1976 Indonesia As a Highway Engineer of Feasibility Study on Central and East Java Road Betterment Project  
1974 - 1975 Inconesia As a Highway Engineer of Technical Support Service for Highway Rehabilitation Project in North Sumatra and Central Java.  
1970 Taiwan Facilities Plan on land of Taichung Harbor, (Home Work Only).
10. Domestic Major Studies in Recent Years:  
1973 - 1974 Preliminary design of Misato Interchange (Turbin-type), Saitama Prefecture.  
1971 - 1972 Reclamated land design of Kaida-bay, Hiroshima Prefecture  
1969 Economic study of Kodama-Bypass for National Route No. 122, Saitama Prefecture.  
1968 Preliminary Design of Omiya-Bypass for National Route No. 16, Saitama Prefecture



- 1967 Paper Location of Tohoku-Expressway,  
Fukushima Prefecture.
- 1966 Supervision of Substructure work for Shin-  
Ohiwatabashi within National Route No. 10,  
Miyazaki Prefecture.
- 1965 Supervision of Pavement work in Shinrin-  
toshi, Fukuoka Prefecture.



March, 1977.

1. Name: KUNIO OHASHI (Coordinator)
2. Home Address: 10-45, 3-chome, Nishihara, Shibuya-ku, Tokyo, Japan
3. Date of Birth: February 11, 1947
4. Nationality: Japan
5. Education: 1969 B.A. in Department of Civil Engineering, College of Science and Technology, Nihon University, Tokyo, Japan
6. Membership: Institute of Traffic Engineering
7. Language: Japanese, English and Spanish
8. Professional Experience:  
1969 - at Present Road and Traffic Division, Mitsui Consultants Co., Ltd., Tokyo, Japan
9. Major Studies Performed in Foreign Countries:  
1976 Indonesia Feasibility Study on Central and East Java Road Betterment Project for Japan International Cooperation Agency (As a Traffic Engineer), (Home Work Only).  
1975 Bangladesh Feasibility Study on Jamuna Bridge Project for Japan International Cooperation Agency (As a Highway Engineer), (Home Work Only).  
Indonesia Feasibility Study on Central and East Java Road Betterment Project for Japan International Cooperation Agency (As a Traffic Engineer)  
1973 - 1974 Bangladesh Feasibility Study on Jamuna Bridge Project for Overseas Technical Co-operation Agency
10. Domestic Major Studies in Recent Years:  
1975 Feasibility Study on Rufiji Bridge Project (Tanzania) for Japan International Co-operation Agency.  
1973 - 1974 Environmental Design of Tokyo Metropolitan Road No. 35 and 36 for Tokyo Metropolitan Government  
" City Planning for Furukawa City (As a Traffic Engineer)



1971 - 1972

Alternative Design of Haraichi Viaduct at Higashi Omiya for Kanto Regional Construction Bureau M.O.C.

Preliminary Design of Morioka Interchange on Tohoku Expressway for Japan Highway Public Corporation

Master Planning of Atsugi Industrial Park for Mitsui & Co., Ltd.

1970

Designing of Kumagaya By-pass for Kanto Regional Construction Bureau M.O.C.

Preparation Job for Dar Es Salaam/Lindi Coastal Link Road Project (Tanzania) for Overseas Technical Cooperation Agency

Master Planning of Atsugi Industrial Park for Mitsui & Co., Ltd.

1969

Detailed Design of Tohoku Expressway at Kamikoochi Yaita for Japan Highway Public Corporation

Preliminary Design of Miyoshi and Shobara Interchange on Chugoku Expressway for Japan Highway Public Corporation





March, 1977

1. Name: MASATAKA MIYAGAWA (Hydrological Engineer)
2. Home Address: 4-104, 587-5, Sakawa, Urawa-city, Saitama Prefecture
3. Date of Birth: July 13, 1945
4. Nationality: Japan
5. Education: 1968 B.E. in Department of Civil Engineering College of Sciencd and Technology, Chuo University, Tokyo, Japan
6. Membership: The Japan Society of Civil Engineers
7. Language: Japanese and English
8. Professional Experience:  
1968 - at Present Road and Traffic Division Mitsui Consultants Co., Ltd., Tokyo, Japan
9. Major Studies Performed in Foreign Countries:  
1973 Tanzania Detailed Design & Hydrographic Study Study of Rufiji Bridge Project.  
(Home Work Only)
10. Domestic Major Studies in Recent Years:  
1976 Detailed Design of Route No. 257 at Akigawa Section  
1975 Alternative Design of Route No. 50 at Shimodate Section  
1972 Detailed Design of Route No. 16 at Omiya, Saitama Prefecture  
1971 Alternative Design of Bridge at Koshigaya, Saitama Prefecture  
1970 Drainage Area of Nogawa River Study



March, 1977.

1. Name: RYUICHI ICHIHARA (Quarry and Geological Engineer)
2. Home Address: 2620, Higashi-Cho, Ogawa, Kodaira-shi, Tokyo, Japan
3. Date of Birth: February 10, 1946
4. Nationality: Japan
5. Education: 1970 B.A. in Science and Engineering Department, Waseda University, Tokyo, Japan
6. Membership:
7. Language: Japanese and English
8. Professional Experience:
  - 1974 - at Present Road and Traffic Division, Mitsui Consultants Co., Ltd., Tokyo, Japan
  - 1972 - 1974 Japan Rock Engineering Co., Ltd.
  - 1970 - 1972 Nihon Koei Co., Ltd.
9. Major Studies Performed in Foreign Countries:
  - 1970 Indonesia Asahan Project
10. Domestic Major Studies in Recent Years:
  - 1975 Planning for Development of Industrial Station at Ejima, Moriyama Area, Shimane Prefecture
  - 1974 Design of Pier at Hibi Port
  - 1972 Study of Reclamation Land Improvement for Uragami Port
  - 1971 Soil Survey of Shirasuna Dam for Tokyo Electric Power Co., Inc.



March, 1977.

1. Name: YOSHIAKI OTOKU (Chief Surveyor)
2. Home Address: 1-11-21, Ouka, Minami-ku, Yokohama, Kanagawa Prefecture, Japan
3. Date of Birth: January 5, 1941
4. Nationality: Japan
5. Education: 1964 Natural Geography, Faculty of Science, Nihon University, Tokyo, Japan
6. Membership:
7. Language: Japanese, English and German
8. Professional Experience:
  - 1975 - at Present Chief Engineer, Photogrammetry Section, Asia Air Survey Co., Ltd. (Main Office), Tokyo, Japan
  - 1972 - 1975 Member of Chief Engineers Section, Asia Air Survey Co., Ltd. (Main Office), Tokyo, Japan
  - 1971 - 1972 Member of Managing Section, Asia Air Survey Co., Ltd. (Chiba Branch), Chiba, Japan
  - 1970 - 1971 Staff Member, Industry Institute of Tokyo University, Tokyo, Japan
  - 1964 - 1970 Engineer, Photogrammetry Department, Asia Air Survey Co., Ltd., Tokyo, Japan
9. Major Studies Performed in Foreign Countries:
  - 1974 - 1975 Bangladesh Surveyor, Jamuna Bridge Construction Feasibility Study,
10. Domestic Major Studies in Recent Years:
  - 1977 Applied Work, Terrestrial Photogrammetry
  - 1975 Planning and Field Work for National Base Map (1/25,000) in Hokkaido Prefecture
  - 1975 Planning and Mapping of Hokuriku Expressway
  - 1974 Planning and Field Work for Terrestrial Photogrammetry of Power Dam Site
  - ✓ 1973 Kanetsu, Expressway Map Planning



March, 1977.

1. Name: MIKIO KURITA (Surveyor)
2. Home Address: 4-4-10, Minaminagasaki, Toshima-ku,  
Tokyo, Japan
3. Date of Birth: August 2, 1950
4. Nationality: Japan
5. Education: 1971 Yahatahama Technical High School,  
Ehime Prefecture, Japan
6. Membership:
7. Language: Japanese and English
8. Professional Experience in Survey Studies  
1971 - at Present Surveyor in the Geodetic Department,  
Mitsui Consultant Co., Ltd.
9. Domestic Major Studies in Recent Years:
  - 1976 Ground Control Survey, Sumata River  
Shizuoka Prefecture.
  - 1975 Terrestrial Survey at Tateyama, Erosion  
Control Barrier, Toyama Prefecture
  - 1974 Ground Control Survey, Watarase River,  
Saitama Prefecture
  - 1973 Terrestrial Survey at Iwaya Dam
  - 1972 Ground Control Survey in Joetsu District
  - 1971 Ground Control Survey in Tonegawa River Area,  
Gunma Prefecture





## Chapter V. Outline of Company

### 1. Corporate Data

1) Name in full:

Mitsui Consultants Company, Ltd.

2) Abbreviation:

M.C.C.

3) Head office:

Mitsui Annex Building, 3-7, 3-chome, Nihonbashi-  
Muromachi, Chuo-ku, Tokyo 103, Japan

Cable Address: MICONTO TOKYO

Telephone: (03) 279-2321

4) Date of establishment:

December 3, 1965

5) Capital:

Authorized Capital: ¥200,000,000

Paid-up Capital: ¥100,000,000

6) Registered:

United Nations, International Bank for Reconstruction  
and Development (World Bank), Asian Development Bank,  
Food and Agriculture Organization, United Nations  
Industrial Development Organization.

Ministry of Construction of Government of Japan.

Consultants No. (51)387, Surveyor No. (4)1625,

Tokyo Metropolitan Government First Class Architect

Office No. 5841

African Development Bank



7) Bank references:

Mitsui Bank, Ltd., Tokyo

Mitsui Trust & Banking Co., Ltd.

8) Fields of activity:

Roads, Railroads, Bridges and Tunnels / River, Erosion Control and Seashore and Offshore Projects / Water Supply, Drainage, Irrigation, Industrial Water Services / Hydroelectric, Thermal Power Development and Related Construction Equipment / Harbors and Airports / Reclamation, Site Formation and Development / Geological Engineering and Foundation Improvement / City and Regional Planning / Industrial Park / Export Processing Zone / Agriculture, Fishery and Forestry & etc.

9) Key personnel:

Chairman of the Board	Yonekichi YANAGISAWA
President	Dr. Hiromasa SATO
Executive Vice-President	Tsuneo OSHIMA
Executive Managing Director	Noritomo OKUDA



2. Service Record of Mitsui Consultants Co., Ltd.

ROAD AND BRIDGE  
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<u>COUNTRY</u>	<u>CLIENT</u>	<u>NAME OF PROJECT</u>
Tanzania	Japan International Cooperation Agency	Study and Design for South Tanzania Coastal Road (1975-77)
Zaire	"	Trans-African Highway Project (1974)
Central East Java (Indonesia)	"	Study for Road Rehabilitation at Central East Java (1975)
Central Java and North Sumatra (Indonesia)	Indonesian Government	Technical Support Service of Highway Rehabilitation (1972)
Bangladesh	Japan International Cooperation Agency	JAMUNA River Project in Bangladesh (1973)

PORT  
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<u>COUNTRY</u>	<u>CLIENT</u>	<u>NAME OF PROJECT</u>
Aguadulce (Panama)	Panamanian Government	Feasibility Study and Basic Design of a New Port at AGUADULCE (1967)
Caleta Morro (Peru)	Peruvian Government	Feasibility Study and Basic Design of Fishery Port at CALETA MORRO (1967)
Mysore (India)	Indian Government	Preliminary Study for KARWAR Port Project (1969)
U.S.S.R.	Japan Cargo Handling Mechanization Association	Design of Oil Loading Facilities of WRANGEL PORT (1970)
Costarica	Costarican Government	Design of CALDERA Port (1974)
Taiwan	Japan International Cooperation Agency	Plan of TAI-CHUNG New Port (1969)



PORT  
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<u>COUNTRY</u>	<u>CLIENT</u>	<u>NAME OF PROJECT</u>
Solomon Island (United Kingdom)	Japan International Cooperation Agency	Rennell Island Mill & Port Study (1975)
Philippines	Mitsui & Co., Ltd.	Design of Loading Port Facilities for Iron Sand at PHILUMAB (1970)

FISHERY AND AGRICULTURE  
\*\*\*\*\*

<u>COUNTRY</u>	<u>CLIENT</u>	<u>NAME OF PROJECT</u>
Vietnam	United Nations Industrial Development Organization (U.N.I.D.O.)	Agro-Industrial Complex in Area in Vietnam (1974)
Brazil	Brazilian Government	SUDENE Fishery Resources Development Project (1974)
Egypt	Egyptian Government	Fishery Development Industries (1974)

ECONOMIC RESEARCH  
\*\*\*\*\*

<u>COUNTRY</u>	<u>CLIENT</u>	<u>NAME OF PROJECT</u>
Sulawesi Island (Indonesia)	Southeast Asian Agency for Regional Transport and Communications Development (S.E.A.T.A.C.)	Economic Study of Ports and Shipping in SULAWESI Island (1976)
Asean Countries	S.E.A.T.A.C.	Public Transport Requirement Intermediate Size City (8 Cities) (1977)





REGIONAL DEVELOPMENT

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<u>COUNTRY</u>	<u>CLIENT</u>	<u>NAME OF PROJECT</u>
Korea	Mitsui Real Estate Development Co., Ltd.	Study and Plan of NAKDONG Coastal Industrial Zone (1973)
Sri Lanka	Mitsui & Co., Ltd.	Plan, Design and Supervision for Out of Colombo Area Telecommunication Development Scheme (1970)
Korea	Korean Government	Basic Plan of Iron and Steel Industry Complex at ASAN (1973)
Canary Islands (Spain)	Organization for Economic Cooperation and Development (O.E.C.D.)	Study of Industrialization in Canary Islands (1971)
Brazil	Japan International Cooperation Agency	Industrial Port Complex of SUAPE (1975)
Indonesia	"	East Java Regional Development Study (1975)
Indonesia	Mitsui & Co., Ltd.	Preliminary Study for Metallized Pallads Plant in East Kalimantan (1969)
Thailand	"	Survey of Location for Petrochemical Project (1970)
Fiji Islands	Nippon Light Metal Co., Ltd.	Feasibility Study and Basic Design of Transportation for Exploitation of Bauxite (1968)
Sulawesi Island (Indonesia)	International Nickel Cooperation of Canada (I.N.C.O.)	Nickel Mining Development Project in SULAWESI (1975)



