

第 5 章 参 考 资 料

Telephone: 83144/9

Telegram: ECONOMICS

Telex: EPUPM MA 30098

Our reference: (20)d1m.UPE SULIT 272/1/7

Your reference:



ECONOMIC PLANNING UNIT,
PRIME MINISTER'S DEPARTMENT,
KUALA LUMPUR, 11-01
MALAYSIA

1st March, 1982.

Mr. K. Takada,
First Secretary,
Embassy of Japan,
AIA Building (6th Floor),
Jalan Ampang,
Kuala Lumpur.

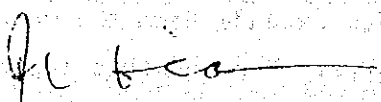
Dear Mr. Takada,

Feasibility Study on Tatau-Kapit Trunk Road

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....
I am glad to submit herewith for your action a duly signed copy of the Scope of Work for the Feasibility Study on Tatau-Kapit Trunk Road project as well as a copy each of the records of the discussion between the Government officials and the Japanese Mission on the above subject. We expect to hear from you in due course the date of arrival of the Study Mission to conduct the feasibility study.

Thank you.

Yours sincerely,


(Ali Abul Hassan b. Sulaiman)
for Director General,
Economic Planning Unit.

1 October 1981FEASIBILITY STUDY OF TATAU-KAPIT TRUNK ROADTERMS OF REFERENCEI. BACKGROUND

With an area of 48,050 square miles Sarawak is almost equal in size to the whole of Peninsular Malaysia and by far the largest State in the Federation of Malaysia. It lies just north of the Equator between latitudes $0^{\circ} 50'$ and 5° North and longitudes $109^{\circ} 36'$ and $115^{\circ} 40'$ East. It stretches for a distance of approximately 450 miles along the north-western coast of the island of Borneo and extends inland as far as the watershed that separates those rivers flowing north and into the South China Sea from those flowing in a broadly southerly direction into the Java Sea.

2. The terrain of the State can be classified broadly into three main groups: the alluvial coastal plain; the mountainous interior; and the central belt of undulating country between the coastal plains and the interior. The flat alluvial coastal plain extends along most of the shoreline of Sarawak and is particularly extensive in the First, Second, Third and Sixth Divisions. This terrain is characterised by deep peat soils, poor drainage, mangrove, nipah and swamp forest and tidal inundation. The soils are extremely acid and chemically poor. Road construction is difficult owing to poor sub-soils.

3. The interior mountainous region extends from the watershed boundaries of the principal Sarawak rivers. Most of this region is over 1,000 feet and substantial areas exceed 4,000 feet. The land is heavily dissected by rivers and covered by primary jungle. Hydro-electric potential is the main economic attraction of this region.

4. The broad central belt of undulating land between the above two geographic extremes extends throughout the State along a north-east south-west axis. It occupies an extensive area in north and central Sarawak, attaining in places a width of as much as 100 miles. Generally, the land here is suitable for development and stable enough for the road network. Existing roads are, therefore, concentrated along this belt.

5. For a long time the most conspicuous feature of road transport in the State was the absence of a general State wide system. Due to physical constraints, road construction and maintenance is a costly affair in Sarawak. The Government's policy bearing in mind the limited resources, has always been not only to construct the maximum mileage of road but also to select the routes carefully in order to achieve maximum rural economic and social development at reasonable costs.

6. The primary objective in respect of road communication under the First Malaysia Plan (1966-1970) was the construction of a trans-state trunk road to link up the major towns in the State and a maximum mileage of feeder roads to open up the surrounding land in order to quicken the tempo of agricultural development. Under the Second and the Third Malaysia Plan (1971-1975 and 1976-1980) continued efforts were made in this direction. By the end of the Third Malaysia Plan the only gap in the First Trunk Road System was a stretch of some 40 miles along the proposed Sibu-Bintulu Road which is expected to be completed by 1983.

7. With the scheduled completion of the First Trunk Road System, the State Government of Sarawak has drawn up plans for the development of a Second Trunk Road System.¹ This system will branch off from the First Trunk Road System and generally run parallel to it and through the broad central belt of undulating land bordering the mountainous region. It is hoped that this Second Trunk Road System will provide reliable access to the potentially rich resources in the interior of the State and link the population in the interior with the established urban and economic centres near the coast.

8. Towards this end the Pacific Consultants International (PCI), sponsored by the Government of Japan through the South-East Asian Regional Transport and Communications Agency (SEATAC), was requested to carry out a Pre-feasibility Study in 1975-1976 on the overall development of the Second Trunk Road System and transport requirements in its hinterland. This Study recommended that detailed feasibility studies be undertaken to determine the most economically

¹ See Map A attached.

viable development programme for the various sections of the proposed Trunk Road System. Due to budgetary constraints and the substantial mileage involved, it is envisaged that the detailed feasibility studies and the subsequent implementation of these sections will have to be carried out in phases. The urgent need to integrate the Fifth Division with the rest of the State and the rapid economic development in central Sarawak had prompted the detailed feasibility study of the Beluru/Long Lama/Limbang Section of the Second Trunk Road. This was completed with assistance from the Japan International Cooperation Agency in late 1979.

9. The Malaysian Government has recently formulated a National Energy Policy with the principal objectives of reducing the nation's overwhelming dependence on petroleum as an energy source on the one hand and the accelerated development of alternative energy sources on the other. Hydro-electricity has been singled out for special mention in the policy pronouncement as one of the best alternative source energy. Fortunately for Sarawak as well as the nation, the rivers in the State has tremendous potential for the generation of hydro-electricity.

10. The interior mountainous region of the Fourth and Seventh Divisions of the State has been identified to be the area with tremendous potential. A study conducted for SESCO under German technical assistance recently concluded that there is a theoretical hydro-electric potential of some 80,000 MW in the State. From among the numerous potential project sites, the study recommended two sites, i.e. at the Pelagus Rapids on the Rajang River and Giam Metjawa on the Balui River, with a total potential of 3,350 MW, to be developed to contribute towards meeting the projected energy requirements of the State, Sabah and Semananjung Malaysia in the near future.

11. Since the potential sites are located in remote and sparsely populated areas, the construction of roads will be a pre-requisite both in the construction of power stations and the transmission lines. Viewed in this light, therefore, besides providing access to the substantial timber and coal resources in the Fourth and Seventh Divisions, the construction of the proposed Tatau/Kapit Trunk Road will be a crucial factor in determining the success of the National Energy Policy.

II. OBJECTIVES

12. The basic objective of the Study is to determine the economic and technical feasibility of developing a portion of the Second Trunk Road System from Tatau to Kapit ~~including the bridges or ferries across major rivers.~~

13. The full Scope of Consulting Services is given in Part V. Briefly the study shall:-

- (a) establish whether it is justifiable to develop the road;
- (b) identify all economically and technically feasible alternative routes, evaluates the socio-economic and environmental impacts of each alternative, and recommend with justifications the route for implementation.
- (c) prepare preliminary and final design proposals and other engineering requirements, cost estimates and financial requirements for each phase of development and programme for implementation;
- (d) identify feeder roads required to serve existing population centres, proposed resettlement areas, and other potential development areas within the area of influence of the proposed road.

III. PROJECT DESCRIPTION

14. The proposed Tatau/Kapit Road is estimated to be some 110 miles long. Its starting point is at a point on the Sibu-Bintulu Trunk Road in the vicinity of Tatau. This Sibu-Bintulu Trunk Road is currently under construction and scheduled for completion by 1983. Depending on local terrain it is anticipated that the alignment of the first 80 miles of the proposed road will follow the Sungei Anap Valley in a generally north-south direction. For the remaining 30 miles, the proposed road will cross the watershed between the Fourth and Seventh Divisions, pass the proposed hydro-electric dam site at

Pelagus Rapids and continue along the Rajang River to a point opposite Kapit town which will be connected to the proposed road by a bridge. Depending on ground conditions and the cost-benefit analysis, there may be a need to construct a branch-off to connect the proposed road to the Pelagus Rapids. The attached Map B indicates the general alignment of this proposed road.

15. In view of the fact that the main factor determining the viability of the proposed road will be the development of the hydro-electric energy, the consultants are expected to liaise closely with the Sarawak Electricity Supply Corporation regarding the inventory and distribution of potential dam sites in recommending the alignment of the proposed roads so as to maximise returns on investment. In particular it is expected that special attention will be paid to the question of resettlement of the population likely to result from the construction of dams at Pelagus.

IV. PROJECT JUSTIFICATION

COMMUNICATION IMPROVEMENT

16. The interior mountainous region including the foothill belt bordering it in the Fourth and Seventh Divisions are virtually devoid of any road system. The very few roads that exist are essentially short and restricted to the immediate vicinity of minor urban settlements. Other land transportation and communication routes in the region are jungle tracks and timber roads which are extremely localised in nature. Under the circumstances, inter-regional transport has to be either by air or rivers. However, air travel is limited by the occurrence of few and widely scattered airfields, and inhibited by the relatively high cost involved and the restricted capacity of the STOL aircrafts. River travel is slow, very often hazardous due to the occurrence of numerous rapids and sometimes uncertain because of its dependence on rain for draught.

17. The proposed study area is precisely in such a setting. Kapit, the Administrative Centre of the Seventh Division, is located some 150 nautical miles (170 statute miles) from the sea on the south bank of the Rajang River. Although the Division has an area of some 15,033 sq. miles, it has at the moment completely no inter-divisional

or inter-regional road. Other than the two small airfields at Kapit and Belaga, both infrequently served by STOL aircrafts, the mechanised mode of transport in the Division is solely confined to motorised rivercrafts.

18. Tatau sub-district which is north of Kapit and through which most of the proposed Tatau/Kapit road will transverse is in many ways even more isolated than the Seventh Division. This area is completely devoid of the service of any mechanised vehicular transport except for the use of motorised vessels along the rivers. Even in respect of water transport, the Anap and the Tatau Rivers are not comparable to the Rajang River as an inland waterway.

19. The Pelagus site is located in a remote part of the State. Therefore, the construction of the Tatau/Kapit Trunk Road is necessary in order to facilitate the construction of the hydro-power station as well as the establishment of the transmission lines from this station to the coastal demand centres.

20. The recent inventory of potential hydro-electric project undertaken by SESCO with assistance from the German Agency for Technical Cooperation indicated that the State has a total of 155 dam sites with an installed capacity of 50 MW each and a combined capacity of 80,000 MW. Of these, 51 sites capable of generating 20,000 MW are considered as technically utilizable potential. A few of these sites, including the Pelagus, with a potential to generate more than 4,500 MW are found in the Upper Rajang River Basin. Therefore, the construction of the proposed Tatau/Kapit Trunk Road will serve to enhance the viability of exploiting potential hydro-electric projects in the Upper Rajang River Basin above Pelagus.

INDUSTRIALISATION

21. The rapid large scale industrialisation of central Sarawak in general and Bintulu in particular has generated intense investment interest both nationally and internationally in the past several years. The projects either already under implementation or in advanced stage of planning include the following: a deepwater port, a LNG plant, an urea-ammonia plant, the Agriculture University, a new airport, a hospital and an extension of the Bintulu township with adequate public facilities and amenities to cater for the anticipated increase in population. It is appreciated that the total energy demand of

these projects will be very substantial. While there are provisions for the use of natural gas to meet some of the energy demand, it is recognised that natural gas is an exhaustible resource and therefore its use as a source of energy can only be a viable in the short term, i.e. up to the point of depletion. In any case, it would generate better overall economic returns to export LNG and use a more cost-effective alternative energy source locally.

22. Viewed in this light, it is clear that industrialisation in the State, particularly heavy industries, will not be possible in the long run without the development of hydro-electric power. This, in turn, is dependent upon the construction of the Tatau/Kapit Trunk Road to facilitate its implementation.

FORESTRY

23. In 1973 the UN Food and Agriculture Organisation was commissioned to undertake a State Wide Forest Inventory Survey. All together 8 units of extensive forest areas with rich timber potential were identified. Of these, certain sections of Units 1, 4 and 5 are located within the hinterland of the proposed Tatau/Kapit Trunk Road. It is estimated that the combined potential yield of commercial timber from the sections of the Units within the Study area will be in the region of some 50 million tons. This is estimated to be sufficient to sustain an annual production of some 1 million tons. In view of the vastness of the Study area which is at present totally devoid of a road system, it is not anticipated that roads will be the most economic mode of transport for timber throughout the area. It is concluded, however, that with the construction of the proposed road, it will be more cost effective to transport 480,000 tons of timber per annum to Bintulu via the proposed Tatau/Kapit Trunk Road. In the absence of the road, the only means of transporting timber is via the Rajang River. This is constrained by the seasonal variation in draught and the occurrence of rapids.

TOURISM

24. A Tourism Masterplan Study commissioned by the Tourist Development Corporation which has recently been completed indicated that the Upper Rajang River Valley is a scenic corridor of great tourism potential. The proposed construction of dams at Pelagus and other sites along the Upper Rajang River will create artificial

lakes by flooding the valley behind the dams. This will further enhance the tourism potential as envisaged in the Master Plan Study. With the construction of the Tatau/Kapit Trunk Road and the development of suitable facilities, it is felt that the area will not only become an attraction to foreign tourists, but also serve a recreational outlet for the population in northern and central Sarawak and particularly the region around Bintulu.

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25. Both the Geological Survey Department and some private prospectors have reported substantial occurrences of coal in the Upper Rajang Valley. While the exact quantity, quality and economic viability of working the deposits has not been ascertained, preliminary estimates put the total reserves in the region of 100 million tons. In the event of the extraction of coal deposits for export, the only logical mode of transportation to the Bintulu deepwater port would be via the Tatau/Kapit Trunk Road.

V. SCOPE OF CONSULTING SERVICES

26. The Consultants shall conduct the Study in two phases. The scope of work as spelt out below shall be undertaken for the proposed trunk road. The analysis to be covered in this Study shall be divided into three interrelated sections, i.e. economics, traffic and engineering.

SCOPE OF WORK, PHASE I

Phase I of this Study shall be carried out in two stages.

These are:

- (i) The Inception Study.
- (ii) Detailed Analysis of Alternatives.

Inception Study

27. This phase will begin upon the commencement of the Study. The main activities involved are:-

- (a) Performance of field reconnaissance;
- (b) Collection and review of existing data;

- (c) Interview with relevant Government Departments and Agencies;
- (d) Conducting traffic surveys;
- (e) Preliminary selection of alternatives;
- (f) Aerial photographic survey along the selected route;
- (g) Determination of the methodology.

(a) Performance of Field Reconnaissance

28. Upon arrival the Consultants shall carry out a field reconnaissance of the Study area to determine the general policy for the execution of the Study. A second reconnaissance will be carried out after Activity (d) in order to obtain detailed data needed for further analysis of alternatives.

(b) Collection and Review of Existing Data

29. The Consultants will then compile and analyse basic data on economics, traffic and engineering, inclusive of, but not necessarily limited to, the following:

(i) Economic Data -

Population and population centres

National and Regional Income

Economic activities (agriculture, mining, forestry, processing industries, tourism power generation)

Import, Export and Consumption of Major Items of Commodities

Price structure of major items of commodities

Public and Private Development Plans

(ii) Transport Data -

Existing Overall Transport Network including land, river and air transport in the influence area

Transport Operation

Vehicle Registration

Traffic Data including those of land, river and air transport

Transport Cost Data

(iii) Engineering Data -

Inventory of Existing Roads and Transport Facilities in the Study area and its surrounding

Contour Maps and Aerial Photographs

Meteorological and Hydrological Data

Design Standards and Construction Specifications

Drawings of Existing Roads

Other Related Survey Data

(c) Interviews with relevant Government Departments and Agencies

30. The Consultants shall have discussions with relevant Government Departments and agencies to obtain information on policies, programmes and plans and applicable as well as relevant standards and specifications which may directly or indirectly influence the proposed project. Where existing plans, long or short term, are available, its impact on the road projects and vice versa shall be assessed.

(d) Conducting Traffic Surveys

31. The Consultants shall undertake additional traffic surveys including a limited O-D survey for river and air traffic in the area where there is no road.

(e) Preliminary Selection of Alternatives

32. Based on the findings of the reconnaissances, the results of interviews with Government authorities, and the results of a preliminary analysis of data collected, the Consultants shall propose alternative routes for the proposed roads. In this regard particular attention should be given to the implication of selecting alternatives that may affect or be affected by future developments in the Study area including, but not necessarily limited to, agriculture, forestry and possible resettlement sites, as well as the likelihood of flooding caused by the implementation of future hydro-electric projects. The Consultants shall recommend, with justifications, the route considered most feasible for implementation. The selected route will be subjected to detailed studies.

(f) Aerial Photographic Survey along the Selected Route

33. The Consultants shall undertake aerial photographic survey along the selected routes. The Consultants will discuss with the Departments of Land and Survey and Public Works in making arrangements for the survey. Based on the survey and further consultations with the above mentioned Departments a topographical map with a scale of 1:10,000 shall be produced.

(g) Determination of the Methodology

34. Based on data which have been collected and analysed, the Consultants shall propose the methodology for further execution of the Study and for the economic evaluation of the project.

Detailed Analysis of Alternatives

35. The Consultants shall then proceed to the next stage of the Study and examine the following:-

- (a) Analysis of socio-economic characteristics;
- (b) Determination of existing and future freight and passenger traffic characteristics;
- (c) Identification of alternative alignments and preliminary engineering study;
- (d) Preliminary economic and financial analysis;

(a) Analysis of Socio-Economic Characteristics

36. The Consultants shall analyse the socio-economic characteristics of the State, in general, and the Study area, in particular, and the potential for growth (or decline) with a relevant time frame. Some of the features to be analysed are population growth and changes in rural and urban population distribution, national and regional economic growth, development of agriculture, forestry, fisheries, mineral resources, tourism, and in particular hydro-electric power, domestic and foreign trade in principal commodities (including energy) and manufactures, and the role of river and air transport in the area to be served by the proposed roads. The analysis shall consider the impact of the completion of the proposed roads on the various socio-economic characteristics.

(b) Analysis of Existing and Future Freight and Passenger Traffic

37. The Consultants shall analyse existing goods and passenger traffic by all modes of transport. The Consultants shall thereafter project future goods and passenger traffic by all modes, including road transportation over the proposed roads.

38. Figures for the present river traffic available from the previous stage of the Study may not be adequate. If this is the case the Consultants are to carry out new traffic surveys. The scope and coverage of such an analysis will depend on the nature of the additional data required.

39. The Consultants are to note that estimates of development traffic are particularly needed for calculation of road capacities and benefits. However, only generated passenger traffic, and not generated truck traffic, are to be included in benefit calculations if indirect benefits (expressed as net value of increased production) are to be considered as well. One of the methods to be applied in calculating the traffic for passengers and local trucks will be gravitation models with population (and/or other economic indices) and distances (time or mileage) as factors. Parameters shall be analysed on the basis of the proposed traffic surveys.

40. The Consultants are also requested to consider estimating development truck traffic based on identifying, describing and

assigning future generating sources and then distributing and assigning the tonnages by type of product based on the expected product movement. The modal-splits shall be basically decided after comparing the transportation costs of competitive modes.

41. The Consultants shall recommend the method to be adopted. The final decision on the methodology for this aspect of the Study shall be made before proceeding to the next phase of the Study.

42. In calculating the financial and economic cost of these projects, the Consultants shall take into account transportation costs including those of different modes, vehicle operating cost by type of vehicle, operating cost by river and time cost. A detailed study of present vehicle operating cost under the prevailing comparable road conditions of the proposed road sections shall be carried out for further cost analysis, possibly based on test driving on existing roads similar to sections of the proposed roads.

(c) Identification of Alternatives and Preliminary Engineering Study

43. The Consultants shall identify alternative alignments and standards on the basis of a review of available maps and aerial photographs as well as the studies proposed in paragraphs above. Reconnaissance field surveys will be carried out to assist in the evaluation of these alternatives and to derive an order of magnitude cost estimate. For the purpose of establishing the best route from the technical point a detailed study of the topography, soil conditions, hydrological conditions, availability of construction materials, construction and maintenance costs will be carried out. The topographical, soil and hydrological conditions will affect the curvature and gradient of the alignment, the types of structures to be made applicable, and the quantity of cut or fill. These major factors affecting the construction cost shall be investigated in detail in the field. The opinion of the Public Works Department, the Sarawak Electricity Supply Corporation, and where necessary the Steering Committee, shall be extensively sought in making recommendations.

(d) Preliminary Economic and Financial Analysis

44. With input data on construction and maintenance costs, the Consultants shall calculate benefits and benefit/costs for the

various proposed alternative solutions for each road section. These analyses shall result in preliminary recommendations for the various road sections. These shall be submitted to the Government for consideration and comments. The Consultants will begin to undertake preliminary design on each section in accordance with the approval and comments of the Government.

SCOPE OF WORK, PHASE II

45. This phase will follow upon the Government's review and approval of the Consultants' recommendation in the Report on Phase I. Aspects of the work to be covered in this phase of the Study shall include the following:-

- (i) Preliminary Engineering Surveys;
- (ii) Preliminary Engineering Designs;
- (iii) Refined Cost Estimates;
- (iv) Economic Analysis;
- (v) Assessment of Local Consultants and Contractors;
- (vi) Proposed Programme for Implementation.

Preliminary Engineering Surveys

46. The Consultants will conduct necessary field investigations, including supplementary topographic surveys, sub-surface soil investigation, and hydrological surveys sufficient for the preparation of preliminary designs. These shall include, but not necessarily limited to, the following surveys:-

(a) Soils and Materials Survey

(i) Roadway

Survey by means of test pits or soil auger will be made in areas along the proposed route at appropriate spots. The samples will be collected, examined and classified, and selected samples will be tested if necessary. Tests will include sieve analysis, determination of plasticity index and liquid limit and CBR tests, if necessary.

(ii) Bridges and Other Important Structure Sites

Auger borings or one penetration tests will be made at necessary bridges and structure sites to such depths that will give adequate information for proper foundation design and study.

(iii) Sources of Materials

A detailed investigation of sources of construction materials including the location of suitable quarry, together with physical material test thereof will be made for selection of economical types of structures and for accurate cost estimation.

(b) Hydrological Survey

Determination of the design discharge of each river and/or stream on the basis of existing data, taking into consideration expected changes in runoff due to construction of the proposed roads.

Determination of water openings for drainage structures as well as required capacity for drainage facilities.

Preliminary Engineering Designs

47. The Consultants shall prepare preliminary engineering designs for the following:-

(a) Roadway Design

Typical roadway sections shall be prepared in detail for each type of roadway involved. Estimates shall be made regarding the quantities of the various construction materials required for the project. The preliminary roadway designs shall be prepared to designated scale. Where details cannot be shown clearly on such plans, the Consultants shall prepare separate drawings as may be required.

The drawing consisting of plans, profiles and typical roadway sections, shall be prepared so as to show the right-of-way, excavations, embankments, and side ditches. Location, type and main dimensions of all structures and other facilities shall be indicated in the same plans.

(b) Pavement Design

Using the traffic data and the soils and materials information, the pavement design for the project shall be developed where required.

The C.B.R. test data and the testing data obtained in the materials surveys, such as sieve analysis tests, specific gravity and absorption tests, and testing data for strength and soundness, shall be fully utilized for the pavement design. Whenever there is a significant variation in the supporting strength of sub-grade materials, separate pavement designs will be prepared. The structural requirement of pavement will be indicated for each design section.

(c) Structural Design

Based on the results obtained from topographic, soils and hydrological surveys, the general plan of the required structure shall be established.

The location and type of structure proposed, span lengths, deck width, type of foundation, channel relocations, etc., should be shown on the plans. Pertinent soils data shall also be indicated. General plans for the structural design of such items as bridges and culverts etc. will be prepared to as appropriate scale.

Major and special bridges will be designed by the Consultants to a preliminary engineering level. Bridge loadings, including special loading, if any, will conform to relevant standards.

(d) Bills of Quantities

After the designs have been completed, Bills of Quantities reflecting all construction items shall be prepared, to be neatly summarized in tabular form and constitute the basis for the construction cost estimates.

Refined Cost Estimates

48. On the basis of the preliminary bills of quantities the Consultants shall prepare an estimate of the cost of construction of the roads. The components of foreign and local currency of all proposed construction shall be identified on the assumption that the work will be done by:-

- (a) the Government construction units;
- (b) Malaysian contractors; and
- (c) foreign contractors.

49. The foreign currency component shall include such items as equipment and its depreciation, materials and supplies, of which Sarawak is a net importer, wages of foreign personnel, overheads and profits of foreign firms. The local component shall include right-of-way acquisition costs, local materials and supplies, local salaries and wages, taxes, etc.

50. A year-by-year expenditure plan shall be prepared in accordance with the proposed construction schedule, the foreign and local currency needs, being classified therein.

Economic Analysis

51. The Consultants shall re-evaluate the benefit and benefit/cost analysis to reflect more refined costs estimates. The aspects to be considered are:-

(a) Benefit Calculation

For each alternative solution direct and indirect benefits shall be calculated. Direct benefits shall be calculated separately for passenger cars, buses

and trucks - possibly for different groups of trucks if a further breakdown appears important for the accuracy of the results. Direct benefits shall be calculated separately for normal traffic, diverted traffic and generated traffic so that normal traffic gets 100% of the savings in vehicle operating costs, development traffic gets 50%² of the savings in vehicle operating cost and diverted traffic gets the difference in vehicle operating costs before (the previously used route) and after diversion.

Since no roads exist in most parts of the area, the benefits shall be derived from the diverted and the generated traffic. Benefits to each unit of such traffic consists of the difference between total transport cost by the old and by the new route. Benefits of increased production could either be included through cost savings for development traffic above mentioned or through addition of net value of increased production, but not both. All use of resources necessary in order to create the production increase should be deducted. Other necessary investments, private as well as in public utilities of all kinds should be included. Present maintenance cost shall be estimated according to the actual expenditures on the road section in question. It is of great importance that the calculation of present vehicle operating cost and present maintenance cost be co-ordinated, so that the vehicle operating cost refer to the maintenance standard given by the maintenance cost used in the Study. In cases where the maintenance standard is very low it may be appropriate to choose a better maintenance standard as basis for both maintenance cost and vehicle operating cost. The benefit calculations shall be divided into two: one for improved maintenance, the other for road improvement. Further maintenance cost will be calculated according to traffic, road

² Unless more accurate estimates can be made, it is common practice to take into account 50% of the cost reductions as benefits to each unit of generated traffic.

type and the prevailing (expected) technique and unit costs.

Besides providing direct benefits as a mode of transport, it is recognised that the roads will also facilitate significantly the transmission of power from the proposed hydro-electric stations to link up with existing power lines. This indirect benefit generated through cost saving in the hydro-electric projects should be assessed in the economic analysis.

(b) Sensitivity Analysis

For each benefit-cost calculations, sensitivity analysis should show the impact of variations in the important input data within their probable range of accuracy.

Assessment of Local Consultants and Contractors

52. On the basis of the type of construction proposed for all road sections, the Consultants shall assess the availability and capabilities of contractors, domestic and foreign. The results of the assessment shall be compiled in the Draft Final Report.

Proposed Programme for Implementation

53. The Consultants shall prepare a proposed Terms of Reference for the detailed engineering designs and a construction time schedule for immediate implementation of the project. The schedule shall indicate the period of time required for the following activities:-

- (a) Final Engineering Survey;
- (b) Preparation of final engineering plans and cost estimates;
- (c) Preparation of tender documents;
- (d) Tender and award.

54. The Consultants shall also prepare a long term plan and construction schedule in order of priority for the staged development of these road projects as well as feeder roads linking population centres and potential development areas.

55. The Consultants shall recommend suitable institutional organisation and management structures required for the effective development and operation of these roads - including training of needed specialised staff.

VI. SPECIAL CONSULTANTS

56. Where specialise advice is required in certain disciplines related to, but not included in, the normal services herein described, the Consultants may, after consultation with and obtaining approval from the Government, arrange for such services. Special consultants in allied fields such as ecology, seismology, tourism and other fields may be retained, either to provide basic data or to obtain an independent review of conclusions reached by the Consultants' staff.

VII. TRAINING

57. It is the intention of the Government to attach qualified serving officers to the Study as counterparts to the Consultants in their relative disciplines (e.g. Economics and Engineering) to be followed with recommended further transportation planning training abroad. The Consultants are expected to identify suitable institutions of learning that can provide appropriate training to enable the candidates to undertake similar tasks upon return to the State.

VIII. DATA, LOCAL SERVICES AND FACILITIES TO BE PROVIDED BY THE GOVERNMENT

58. The Government will establish a Steering Committee to review project activities, give general guidance to the project and ensure co-operation of Government Agencies in the attainment of the project objectives.

59. The Steering Committee will be responsible for monitoring the project and the realization of its objectives as described in Part II of this document.

60. The Government will provide the Consultants with office space, furniture, equipment and office supplies, administrative,

secretarial and clerical services, utilities, telephones, postage and telegraph services and transportation within Sarawak for professional use.

61. The Government will provide to the Consultants on request all available data that are relevant to the Study.

IX. CONSULTANTS UNDERTAKING

62. The Consultants shall undertake to carry out the Study in accordance with the terms of this document.

63. The Consultants shall as far as possible make use of local technical services.

64. The Consultants shall carry out most of the consulting work including design at the Consultants' office to be established in Kuching. The work items which require special processing by electronic computer, such as economic and structural analyses, and, other, can be handled at the Consultants' home office.

X. REPORTS

65. The Consultants shall submit to the Malaysian Government the required number of the following reports (in English):-

(i) Progress Reports (50 copies)

These Reports shall, at monthly intervals after commencement of work, except when it coincides with another reporting stage, give a statement of all work performed during the reporting period, and the schedule of work for the next reporting period.

(ii) Inception Report (50 copies)

This Report shall summarise the initial findings of the Consultants. It shall contain a statement of the Consultants' proposed study procedures and work schedule and raise any particular problems with regard to data availability, need for additional data

or other critical matters pertaining to and affecting the execution of the Study. This Report shall be submitted after completion of all aspects of the Inception Study.

(iii) Interim Report (50 copies)

This Report shall be submitted upon completion of the Phase I studies. It shall summarise all work performed under Phase I of the Study, and findings and recommendations relevant to aspects of the Study so far undertaken by the Consultants.

(iv) Draft Final Report (50 copies)

This Report shall summarise all work performed under Phase I and II of the Study, together with findings and detailed recommendations. The Report shall include, inter alia, complete information on the economic and engineering data evaluated, discussion on methodologies, analyses and procedures employed and shall provide maps, plans and diagrams of the proposed construction works.

(v) Final Report (120 copies)

This Report shall incorporate all revisions deemed appropriate by the Consultants after receiving comments on the Draft Final Report from the Government.

66. All Reports shall contain a concise summary of all major findings and recommendations of the Consultants. The estimates of economic costs and benefits and all economic analyses which support the Consultants' conclusions shall be presented in sufficient detail to permit checkings of all calculations without supplementary data. The Draft Final Report shall be carefully edited and completed so that production of the Final Report can proceed without delay.

67. All Reports and documents shall be the property of the Malaysian Government.

68. The Consultants shall submit reports other than those listed above when required by the Government.

XI. SCHEDULE OF STUDY

69. The Consultants shall commence field work on this project within thirty (30) calendar days after the issue of the Letter of Intent.

70. The Consultants shall submit the required Reports within the following time schedule:

- (i) Progress Report: once a month after the commencement of work except when it coincides with another reporting stage;
- (ii) Inception Report: within two (2) months of commencement of work;
- (iii) Interim Report; within ten (10) months of commencement of work;
- (iv) Draft Final Report: within twelve (12) months of the date of notification by the Government of approval of the Phase I Study; and
- (v) Final Report: within two (2) months after receipt of comments on the Draft Final Report from the Government.

様式

主管部長	文書管理課長	主管課長	情報管理課長	図書資料室受付印

収集資料リスト

5-2 入手図面リスト

昭和 年 月 日 作成

地域	アジア	調査団	タタウ・カピト幹線道路計画	調査の種類	事前調査	作成部課	社開協部・開調一課
国名	マレーシア	等名称	事前調査団	現地調査期間	57年2月1日~57年2月18日	担当者氏名	

番号	資料の名称	形態	版型	ページ数	オリジナル コピーの別	部数	収集先名称又は発行機関	寄贈・購入 (価格)の別	取扱区分	利用 表示	利用者 所属氏名	納入予定日	納入 確認欄
1	1/100万 西マレーシア地勢図												
2	クアラ・ルンブール街路図												
3	1/1万 クチン市市街図												
4	1/76万 サバ・サラワク州図												
5	1/5万 地形図(TATAU, BUKT NAONG, SUNGAI ANAP, PELAGUS, KAPIT, MERIT)												
6	1/25万 地形図(5面, 報告書2冊)												
7	1/125万 土壌図及調査概要表(図4, 表2)												
8	1/100万 サラワク州人口分布図												
9	1/100万 サラワク州道路建設予定表(第4次 マレーシア・プラン)												
10	1/25万 SESCOダム建設地点及取付道路計画図												
11	1/200万 サラワク州森林材採区域図												
12	1/50万 サラワク州地勢図												
13	1/100万 サラワク州年次別空中写真撮影実施一覧図												
14	サラワク州地形図作成年次計画図												
15	1/1.6万及1/1万 空中写真サンプル(2モデル)												
16	ISD機構図												

国際協力事業団

主管課長

様式

主管部長	文書管理課長	主管課長	情報管理課長	図書資料室受付印

収集資料リスト

5-3 入手書籍リスト

昭和 年 月 日 作成

地域	調査団	調査の種類	作成部課
国名	等名称	現地調査期間 年 月 日 ~ 年 月 日	担当者氏名

番号	資料の名称	形態	版型	ページ数	オリジナル コピーの別	部数	収集先名称又は発行機関	寄贈・購入 (価格)の別	取扱区分	利用 表示	利用者 所属氏名	納入予定日	納入 確認欄
	Estimates of Revenue and Expenditure Sarawak, Malaysia	Book		252	Orig	1	Sarawak State Govern.						
	Annual Statistical Bulletin, Sarawak 1980	Book	A4	199	Orig	1	Dept. of Statistics						
	Basic Tables - Selected Industries, Sarawak 1976	Book	A4	54	Orig	1	Dept. of Statistics						
	Agricultural Statistics of Sarawak, 1980	Book		De 123	Orig	1	Dept. of Agriculture						
	Sarawak Hydorlogical year book, 1977 & 1978	Book	B5	577	Orig	1	Drainage and Irrigation Dept.						
	The Geology and Mineral Resources of the Upper Rahang and Adjacent Areas, Sarawak	Book	B5	181	Orig	1	Geological Survey Dept.						
	The Geology and Mineral Resources of the Lower Rajang valley and Adjoining Areas, Sarawak	Book	B5	167	Orig	1	Geological Survey Dept.						
	Master Plan for Power System Development April, 1981 (Summary, Vol.I Text, Vol.II Annex, Vol.III Appendices)	Book	A4		Orig	1	Sarawak Electricity Supply Corporation						
	Fourth Malaysian Plan Proposals (Phase Two) on Roads and Bridges, July 1980	Book			Orig	1	Public Works Dept.						
	Specification for Steel girder bridges				Copy	1	British Standards Institution						
	Maximum and Minimum Water Level Records Card (Tatau river) 1979, 1980				Copy	1	Drainage and Irrigation Dept.						
	Cross-Section of Batang Rejang at Kapit				Copy	1	Drainage and Irrigation Dept.						
	Mileage of Road Construction 1985 - 1958				Copy	1	Public Works Dept.						
	Mileage of Road Construction 1958 - 1981				Copy	1	Public Works Dept.						
	Issues in Malaysian Development	Book		418	Original		Asian Studies Association of Australia						
	Malaysian Politics	Book		483	Orig	1	Hodder and Stoughton						
	Malaysia's Green and Timeles World	Book		221	Orig	1	Heinemann Asia						
	Malaysia Development Pattern and Policy	Book		267	Orig	1	Singapore University Press						
	Malaysia 2001 A Preliminary Inquiry	Book		286	Orig	1	The Syed Kechik Foundation						
	Vanishing World/The Ibans of Borneo												

国際協力事業団

図書資料室提出用

5-4 面会者リスト

a. Economic Planning Unit, Prime Minister's Department

Mr. Ali Abul Hassan Sulaiman	Director of Infrastructure and Utilities
Mr. Anuar bin Khabar	Infrastructure and Utilities Division
Mr. Ismail bin Mohammed	Infrastructure and Utilities Division
Mr. Kanakatsu	Infrastructure and Utilities Division
Ms. Puan Wong Peg Har	Infrastructure and Utilities Division

b. Ministry of Works and Utilities

Mr. Lamlem bin Sawiyo

c. Ministry of Finance

Mr. Wong Chai Sool

d. Implementation and Coordination Unit, Prim Minister's Department

Mr. Annies bin Md. Ariff

e. Highway Planning Unit

Mr. E. Balasubramaniam	Director
Mr. Ong	Assistant Director

a. State Planning Unit, Sarawak

Mr. Mohd. Aminurashid bin Mohd. Zan	Director
Ms. Sutin bte Sahmat	Secretary

b. Ministry of Communication and Works, Sarawak

Tuan Hj. Saad bin Hassan

c. Public Works Department, Sarawak

Mr. Michael Parker	Director of Airfield and Road Branch
Mr. Dominic Chong	
Mr. Ho King Swee	
Mr. Wong Hung Huang	Divisional Engineer, Bintulu
	Divisional Engineer, Kapit

d. Land and Survey Department

Mr. Haji Borhan Sablo Director

Mr. Said Haji Bujang

e. Geological Department

Mr.

f. Drainage and Irrigation Department

Mr.

g. Agriculture Department

Mr.

h. Sarawak Timber Industry Development Cooperation

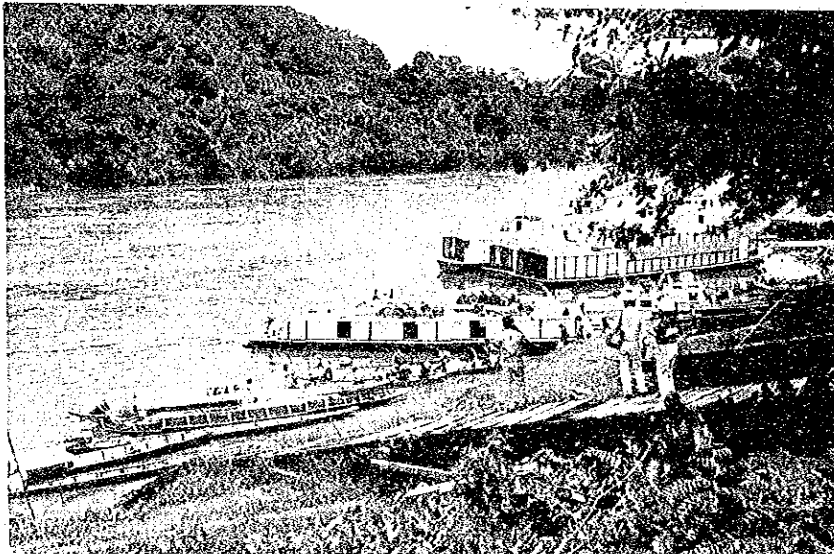
Mr.

i. Sarawak Electricity Supply Corporation

Mr. Kong Aii Ting



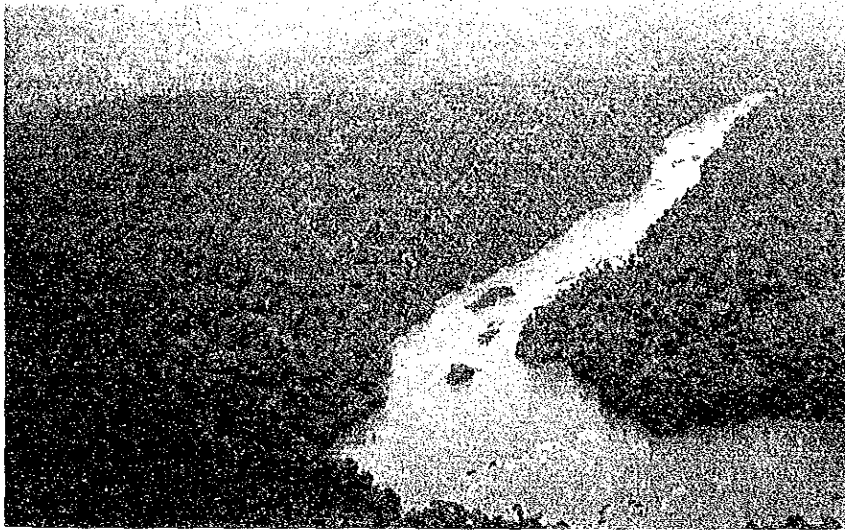
① カビトの町並と中央広場



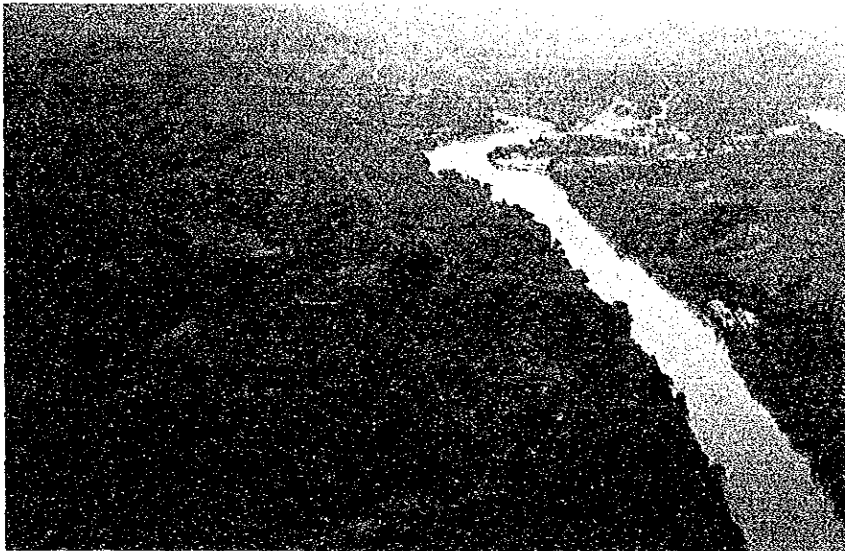
② ラジャン川とカビトの船着場



③ 調査地域の至る所で見られる
TIMBER ROAD



④ カピト上流のラジャン州
（カピトより上流は急流部が
あり船舶の航行は困難となっ
ている）



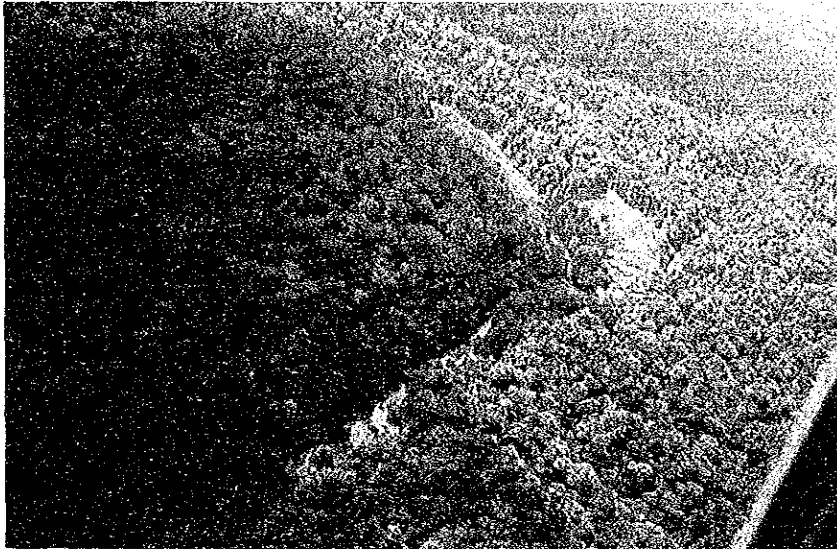
⑤ ラジャン川のペラガスダム
建設計画地附近



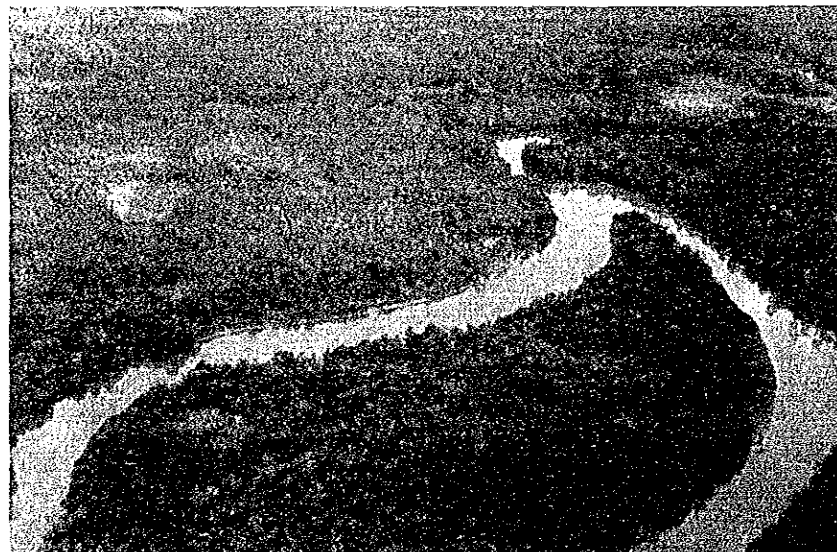
⑥ 背斜山稜と同斜谷の連続する
山脈地帯



⑦ ペラガス～サンカップ間のロ
ンダ峠附近のジャングル地帯



⑧ ペラガス～サンカップ間の
ジャングル地帯



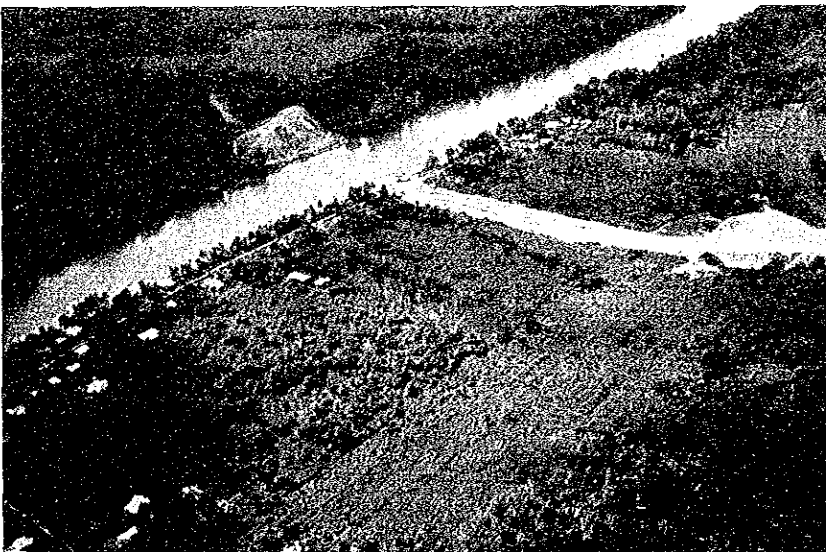
⑨ 蛇行するタタウ川中流部



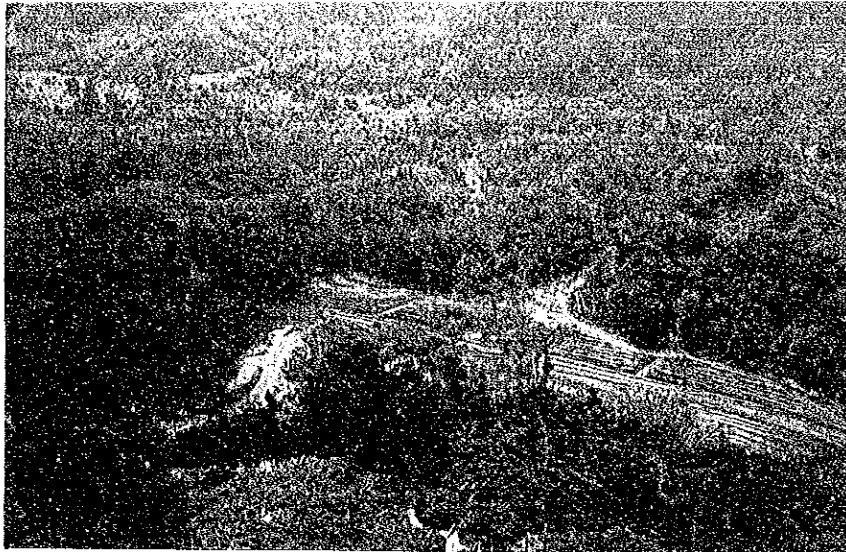
⑩ サンカップ～タタウ間の
タタウ川上流部



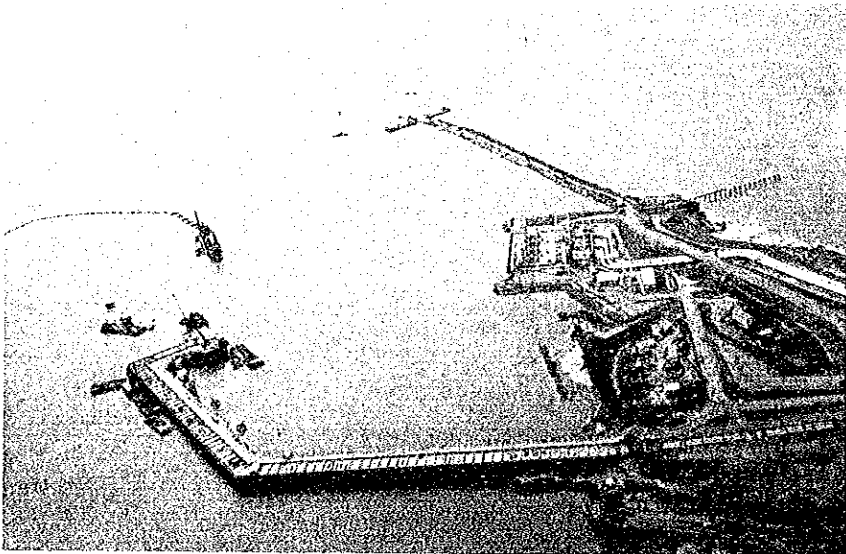
⑪ タタウの集落



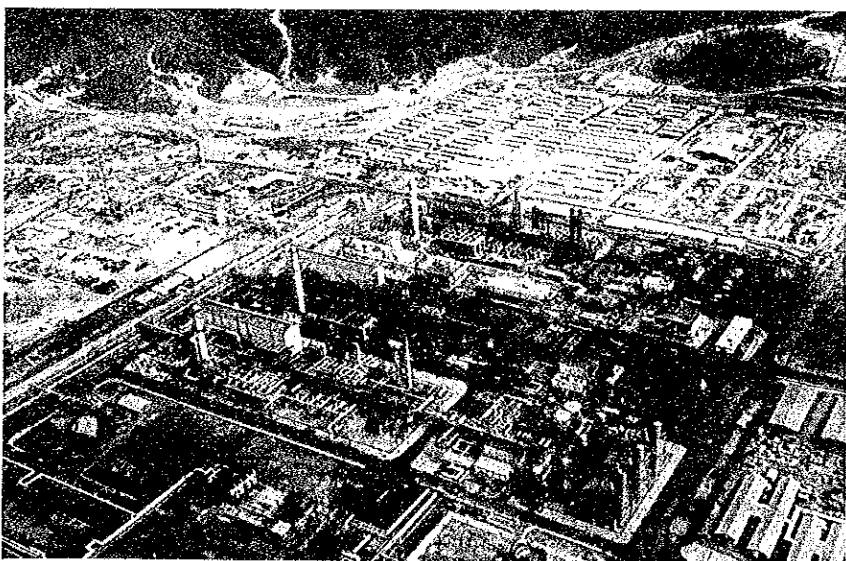
⑫ タタウ川まで達したサラワク
幹線道路
(本件道路はこの附近で幹線
道路とT交差することになる)



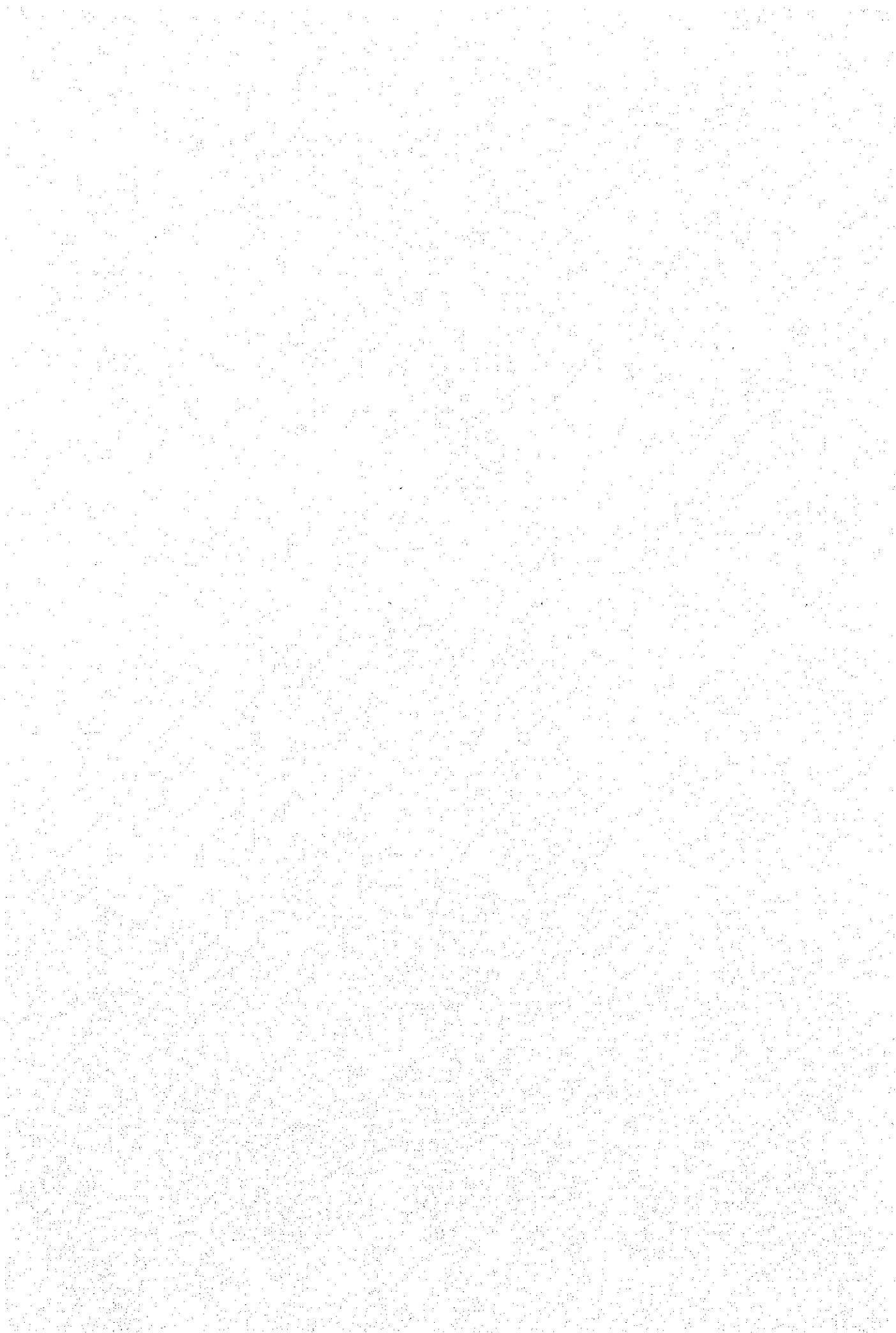
⑬ 急ピッチで整備される
サラワク幹線道路

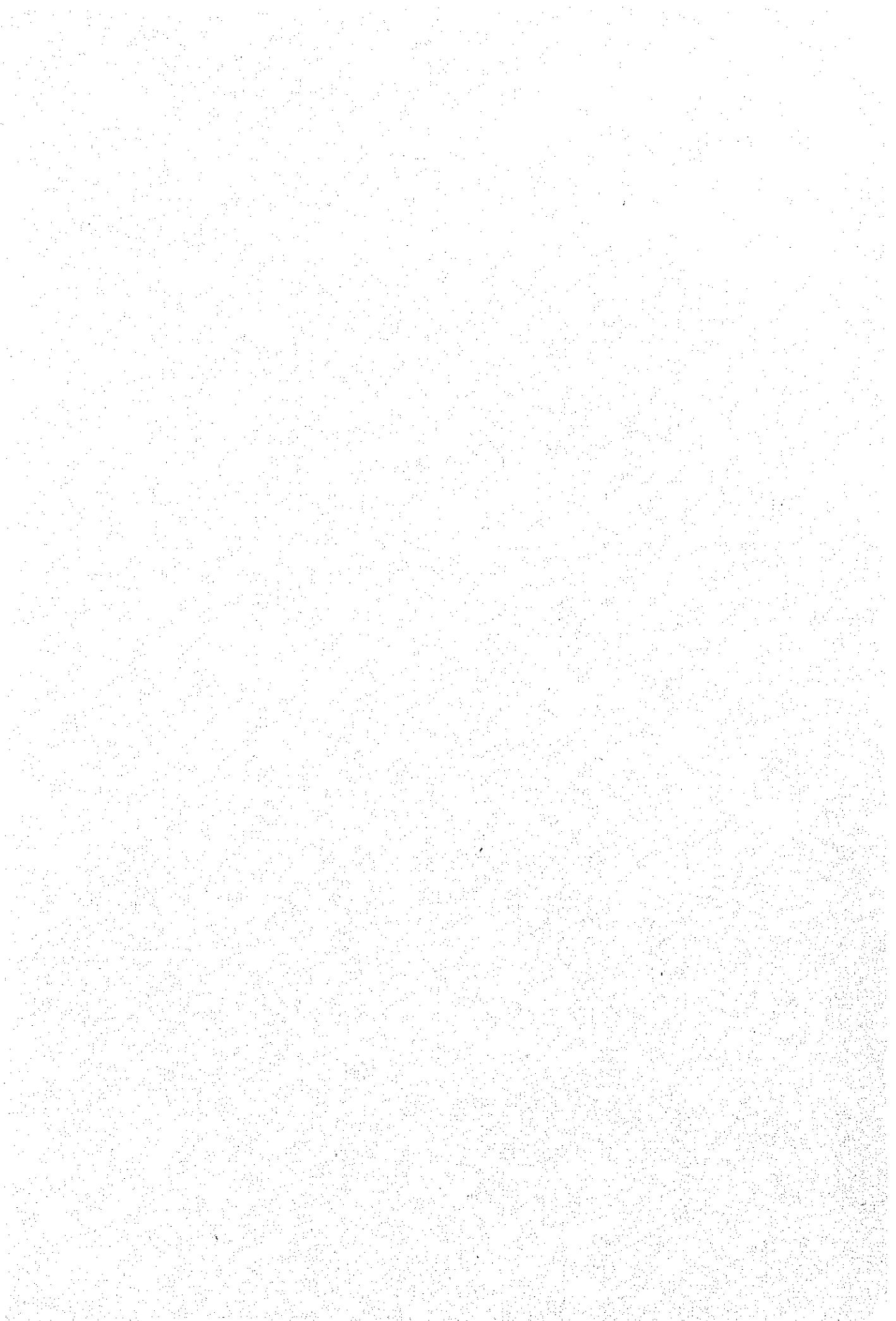


⑭ 建設中のピンツル港



⑮ 急ピッチで進められている
ピンツルの工業地帯





JICA

