No. 9

ISLAMIC REPUBLIC OF PAKISTAN

STUDY REPORT ON THE CONSTRUCTION PROJECT OF A MINI-PORT IN GWADAR

MARCH 1989

JAPAN INTERNATIONAL COOPERATION AGENCY

[redacted]

No. 9

ISLAMIC REPUBLIC OF PAKISTAN

STUDY REPORT

ON

THE CONSTRUCTION PROJECT OF A MINI-PORT IN GWADAR

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MARCH 1980

社会開発協力部報告書

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to the request from the Government of the Islamic Republic of Pakistan, the Government of Japan has decided to conduct a study necessary for the Gwadar Mini-Port Construction Project, which is designed for the modernization of the fishery industry in Baluchistan Province. This study was entrusted to the Japan International Cooperation Agency (JICA) for conducting the work.

The JICA organized a study team, headed by Mr. Minoru Soya and comprising experts of the Overseas Coastal Area Development Institute of Japan (OCDI) and Kiso-Jiban Consultants Co. Ltd. for this project.

After the completion of the field surveys in Pakistan, the study team analyzed their findings along with data obtained with the cooperation of the Government of Pakistan, discussed these matters with the Pakistan authorities concerned, and completed the final report for submission to the Government of Pakistan.

I hope this report will be useful in promoting the socio-economic development of Baluchistan Province and contribute to the furtherance of the friendship between our two countries.

I express my sincere appreciation to the Government and the people of Pakistan for their cooperation and invaluable assistance extended to the study team.

March, 1980

Keisuke Arita

Keisuke Arita
President
Japan International Cooperation Agency
Tokyo, Japan

LETTER OF TRANSMITTAL

March, 1980

Mr. Keisuke Arita, President
Japan International Cooperation Agency

Dear Mr. Arita:

It is my great pleasure to submit herewith the study report on the Gwadar Mini-Port Construction Project, for the Islamic Republic of Pakistan.

For examination of the site and preparation of the study, the Japanese Study Team, headed by myself, carried out field survey in Pakistan from 25-9-78 to 23-10-78, 5-1-79 to 18-1-79, 25-5-79 to 22-6-79, 29-6-79 to 2-8-79, 17-9-79 to 14-10-79, and 5-2-80 to 18-2-80, at the request of the Japan International Cooperation Agency.

In this report, the field surveys conducted by the Overseas Coastal Area Development Institute of Japan, and the soil survey in Pakistan conducted by Kiso-Jiban Consultants Co. Ltd., are analysed and discussed, to formulate a Mini-Port Construction Project and to examine the feasibility of the project.

The Government of Pakistan expects this project to play a vital role in the regional development programme. During the surveys, the Japanese Study Team joined efforts with their Pakistani counterparts to make a thorough analysis of all major engineering problems. As a result, the Japanese Study Team and the Pakistani Authority in charge prepared a final design of the port facility.

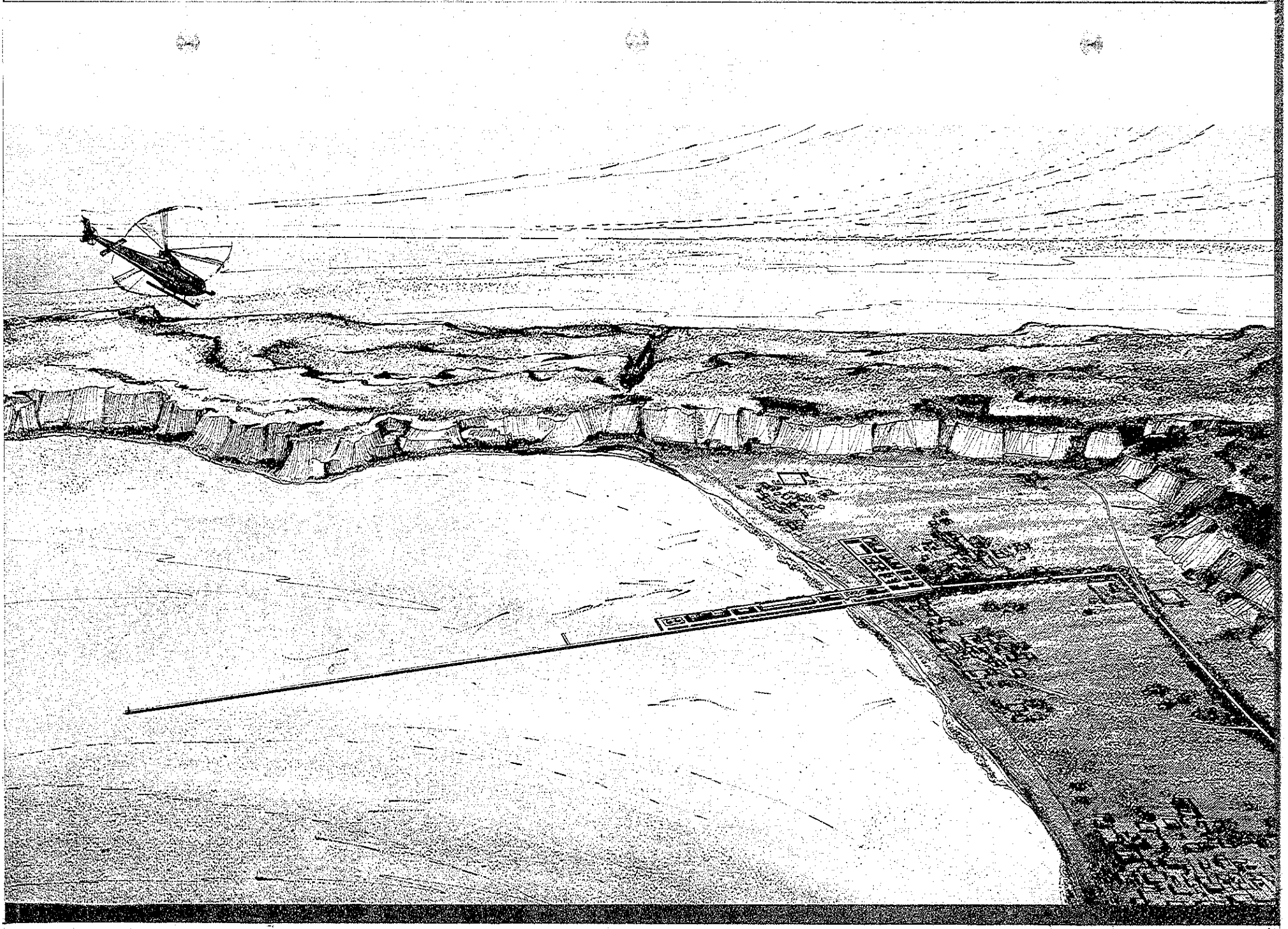
On behalf of the Japanese Study Team, I would like to express my deepest appreciation to the Government of the Islamic Republic of Pakistan, the Ports and Shipping Wing, and other Governmental Organizations for their steady cooperation, assistance, and hospitality extended to the team during its stay in Pakistan.

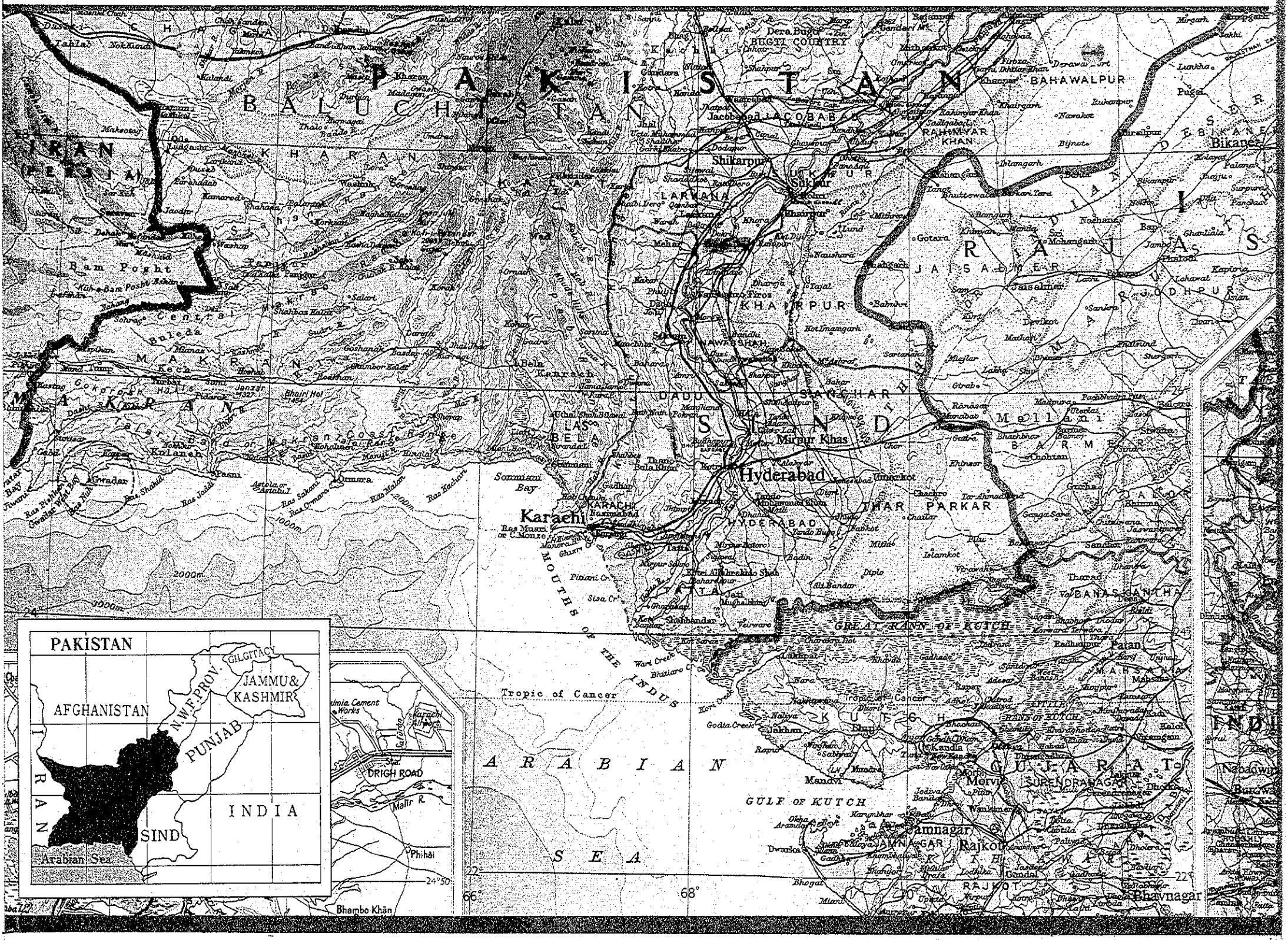
My indebtedness is also great to the Japan International Cooperation Agency, the Ministry of Transport, the Ministry of Foreign Affairs, the Japanese Embassy in Pakistan, and the Japanese Consulate General in Karachi for their valuable suggestions and assistance in the field survey and in the preparation of this report.

Sincerely yours,

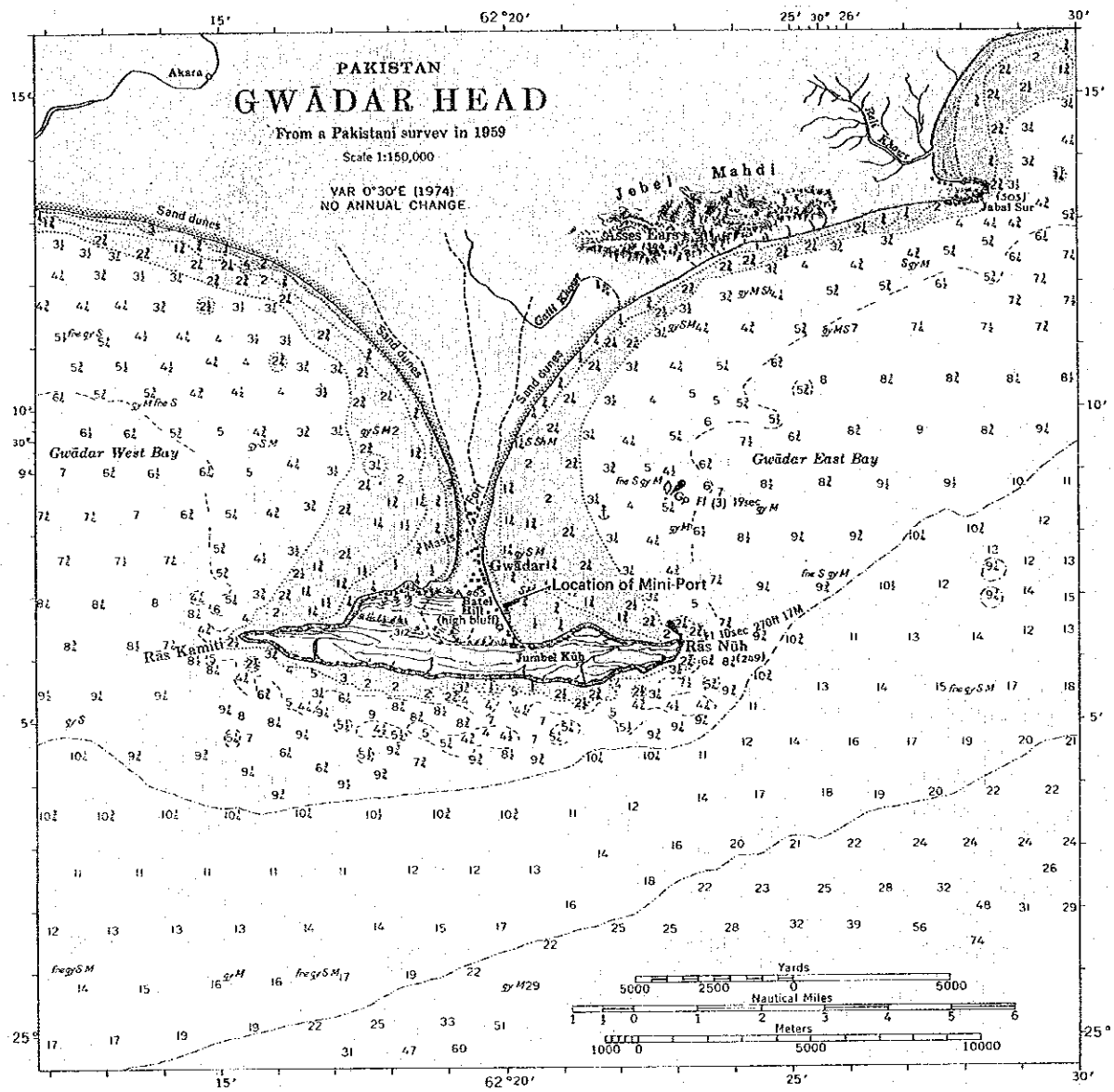
Minoru Soya

Minoru Soya, Leader
Japanese Study Team for the Gwadar
Mini-Port Construction Project
Director of Planning,
The Overseas Coastal Area Development
Institute of Japan

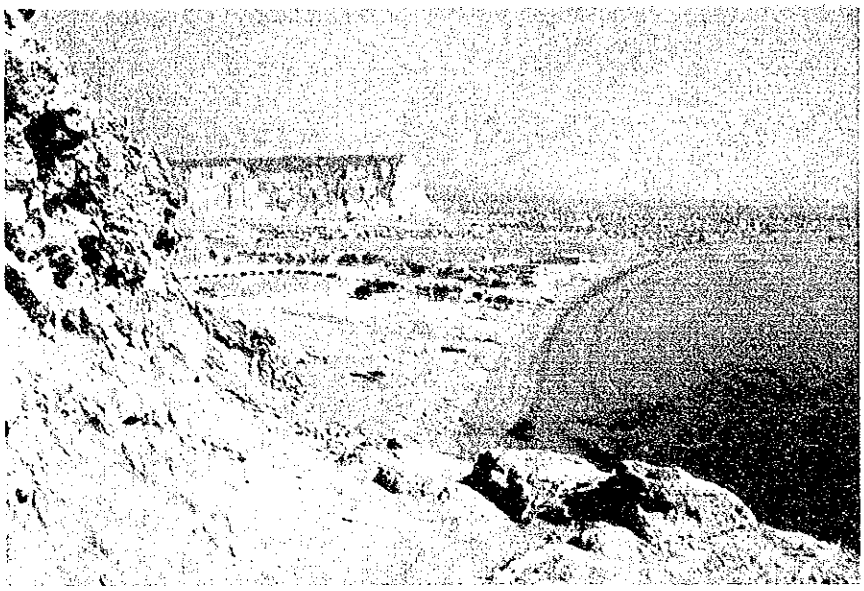



PAKISTAN
BALUCHISTAN
IRAN (PERSIA)
KHARAN
KALAT
MAKRAN
Bam Posht
Central Bleda
Kolanch
Gwadar
Pasni
Omara
Sonmiani Bay
Karachi
KARACHI
Hyderabad
HYDERABAD
Mirpur Khas
SHAHEHAR
NAWABSHAH
KHAIRPUR
Sukkur
Shikarpur
Jacobabad
LARKANA
Dadu
Sehwan
Bela
Kanrach
LAS BELA
Dera Bugti
BUGTI COUNTRY
BAHAWALPUR
RAHIMYAR KHAN
BIKANER
JAISALMER
JODHPUR
THAR PARKAR
GREAT RANN OF KUTCH
LITTLE RANN OF KUTCH
KUTCH
Bhuj
Kandla
Mandvi
Morvi
SURENDRANAGAR
Jamnagar
Rajkot
RAJKOT
Bhavnagar
Patan
BANASKANTHA
MEHSANA
Nabadwip
Tropic of Cancer
ARABIAN SEA
GULF OF KUTCH
MOUTHS OF THE INDUS
DRIGH ROAD
Phihai
Bhambo Khan
Mallir R.
Karachi Airport
Sta.
Cement Works
PAKISTAN
GILGIT AGY.
N.W.F. PROV.
JAMMU & KASHMIR
AFGHANISTAN
PUNJAB
IRAN
INDIA
SIND
Arabian Sea
66°
68°
24°50'
22°

Location of Mini-Port

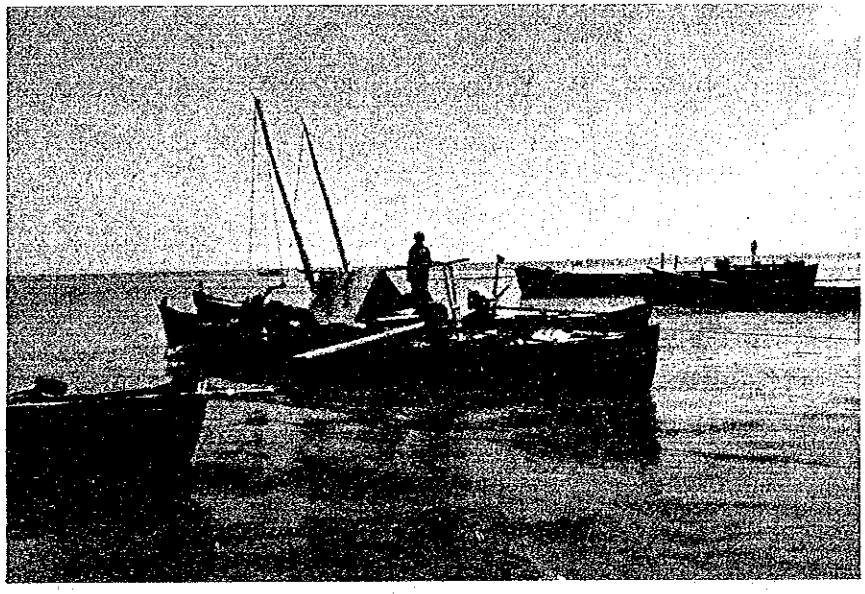


View of Site from Headland



Bazaar in Gwadar

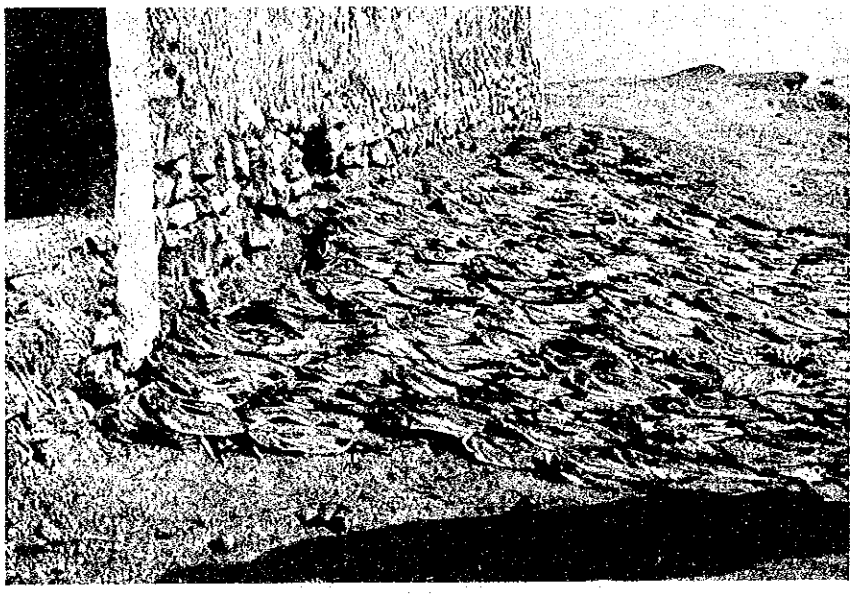
Motorized Fishing Boats



Fish Catch

Fish Market on Natural Beach

Dried Fish



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Summary

SUMMARY

1. Character of the Project

Gwadar is a small provincial city facing the Arabian Sea on the west part of the Makran Coast in Baluchistan Province. Cities and towns on the coast do not have any port facilities, nevertheless fishery is very active there. Among them, Gwadar is the core of fishery; it records twenty thousand tons of fish catch per year in 1978.

This project intends to make a beginning of development on the Makran Coast, which has been left behind in the march of progress. It also responds to the federal policy promoting the development of the fishing industry, and is a plan to secure a sure means of transporting commodities. Therefore this project shall serve to raise the standard of living in this district.

2. Intents of Development

The intents of the development plan are:

1) to furnish the port with the essential facilities of a fishing port and to promote fishing industry,
2) to equip the port with fishery related facilities, such as freezing and ice plant, and to keep marine products fresh and thereby raise their value,
3) to improve the loading method of commodities from Karachi, and insure regular supplies, and
4) to make Gwadar a starting point for development of the region by the total effect of aforesaid intents.

3. Socioeconomic Background of the Site

Baluchistan Province is the largest but the least developed of the provinces. However, the average annual increase in population is high, especially along the Makran Coast as well as in Gwadar, and reflects the rapid growth of fishery activities. Although fishery accounts for only 0.4 to 0.6% of GDP in the country, it is approximately 4% in Baluchistan Provice; this indicates that the fishery sector makes a large contribution to GPP in Baluchistan Province. In addition, the only industry in the city of Gwadar consists of fishery and its related services.

The fishermen in Gwadar increased from 5,671 persons in 1976 to 6,531 persons in 1978, and is approximately one third of the population of the city. These figures tend to confirm that living in Gwadar is based on fishery.

4. Present Situation of Fisheries

There are large fish resources along the Makran Coast, and the area is actively fished.

Fish, a food as rich in animal protein as meat, can be a supply source to Pakistan, but its intake by Pakistani people is still at a very low level for lack of refrigeration equipment and an

effective transportation system.

Although fish is one of the major export commodities especially shrimp and lobster in Pakistan, Baluchistan coast, including Gwadar, is shortcoming in modern processing facilities. This results in a large quantity of sun dried products of poor quality.

The trend of motorization of the fishing crafts in the marine fishery, especially in Gwadar, is remarkable. One of the results of motorization has been an increasing fish catch in recent years.

The fish catch of Gwadar accounted for about 37%, or 24,125 tons, of the total products of Baluchistan coast, that is 65,096 tons in 1978. Gwadar is the most active fishing port on the coast.

5. Forecast for Fishery and Coastal Shipping in Gwadar

(1) Target year for programme

Acting on the request of the Government of Pakistan, target year of 1983 is set, to coincide with the target year of the Five Year Plan.

(2) Forecast for fishery

Forecast has been made for a period of 30 years, from 1976 to 2006. The following three points were taken into consideration:

a) the records for the country and for Baluchistan Province in the last five years were compared with the targets of the Five Year Plan, for the purpose of determining the limiting conditions of the forecast,

b) the population in the vicinity of Gwadar in the early 2000's is estimated to be a maximum of 80,000, because of limited water resources, and

c) fishing resources in the local fishing grounds of Baluchistan Province are estimated to be 400,000 tons per year maximum, according to the reports conducted by both Soviet and Japanese fishery survey vessels.

Results of Forecast

upper column: Baluchistan Province
lower column: Gwadar City

Year	Unit	1977	1983	1990	2000
Population	persons	367,240 18,738	522,070 25,967	742,190 35,987	1,226,810 57,358
Fishermen	persons	20,409 7,288	25,739 10,207	30,669 13,504	39,445 21,413
Vessels	boats	2,385 814	2,733 970	3,201 1,180	4,011 1,597
Vessels with motor	boats	372 162	1,124 549	1,605 800	2,809 1,380
Fish catch	tons	68,810 21,277	141,540 62,758	191,640 91,344	311,840 157,406

(3) Forecast for coastal shipping

It is assumed that living commodities will be transported by small cargo boats (100 – 200 G/T) from Karachi; 45 calls per year are forecast.

(4) Design capacity of fish handling facility

The design capacity of the fish handling facility is set at a nominal catch of 250 tons per day and 60,500 tons per year.

6. Natural Environment

(1) Climate: This area is in the arid zone of median latitudes, and it is classified as a subtropical steppe or desert. With infrequent precipitation, the most common vegetation are shrubs and dates. Seasons are divided into SW and NE monsoons, and the usually weak winds change in the morning and afternoon.

(2) Geology: The land consists of the layers from the Pliocene and Pleistocene eras. A recent alluvial sand spit underlies Gwadar City.

(3) Marine condition: The East and West Bays are protected by the Headland against waves from the Arabian Sea, the wave height is reduced to a maximum of 1.5 m in these bays. Currents are slow, with a speed of less than 0.5 kt.

(4) Soil: Generally the surface layer, a thickness of several meters, is soft and weak and cannot bear a gravity type structure. Layers below are of stiff clay or dense sand, which make a piled structure possible.

(5) Earthquakes: Though only one record of a large earthquake exists in this district, Gwadar belongs to a moderately active earthquake zone.

7. Planning of Facilities

(1) Port facilities: Fishing boats, small cargo vessles, and small oil carriers (with drafts of 8 feet) were considered. The water depth of the quay, basin and channel is set to be -3.0 m, to accommodate these crafts. Additional facilities with a water depth of -1.5 m are included, partly for small fishing boats. The major port facilities are:

1) land reclamation and revetment
2) piled wharf with water depths of -3.0 m and -1.5 m
3) groin
4) channel and basin
5) small dredger for maintenance dredging with a dump barge

(2) Fishery related facilities: For handling, freezing, and storing fish products, the following facilities are necessary.

1) fish market*
2) warehouse*
3) ice, freezing and refrigeration plant
4) refrigeration vessel
5) water, fuel and electricity supply**

These facilities are planned to meet a fish catch of 250 tons per day; one fourth to be refrigerated and 10 tons to be frozen.

(3) Other related facilities: Following are planned for managing and maintaining the port and fishery related facilities.

1) road**
2) parking area**
3) administration office*
4) fence, gatehouse, illumination fixtures, etc.*
5) additional space*

Note:

* These items are excluded from the cost estimation of this report.

** These items, only in the reclaimed area, are included in the cost estimation.

8. Construction Plan

(1) Structure

A piled wharf has been selected as a quay structure to maintain stability against circular failure; rubble mound has been selected as revetment and groin.

(2) Construction materials

Construction materials, such as filling material, stone, and concrete aggregate, must be taken from the vicinity of the site. The material quality may not be adequate, so it is important that quality control is maintained in the construction stage. Steel shall be imported and cement is relatively easy to obtain locally.

(3) Construction machinery and vessels

Construction equipment suitable to the scale of the construction work may not be available in Pakistan except for a few items. Thus it may be necessary to temporarily import most heavy machinery and equipment.

(4) Transportation of construction equipment and materials

There is not port facilities in Gwadar at present. In addition, the road between Karachi and Gwadar is very rough, so it will be difficult to transport construction equipment and materials quickly but safely to Gwadar.

(5) Main works

Main works related to the construction of port facilities can be classified into riprap, filling, armour stone, dredging, pile driving, concrete and paving work.

(6) Construction cost

The construction cost of the facilities required for the Mini-Port, has been estimated by the Japanese Study Team to be 4,500 million yen ($22,500,000 USD) in 1979 money.

It is required to add a price escalation to the above total construction cost. If 30% escalation for three years is assumed, the construction cost will be 5,850 million yen ($29,250,000 USD).

(7) Construction period

About two years will be necessary for the construction of this project.

9. Development Effects

(1) Costs are calculated for the following 3 items.

a) Construction cost

b) Management, maintenance and operation costs

c) Costs of other related facilities

(2) Direct benefits are expected in the following 4 items:

a) National economic benefits, obtained from the increase in fish catches

b) Benefits obtained by exporting shrimp via Karachi

c) Benefits from transport of basic commodities by small coastal vessels

d) Benefits from wheat transport by trampers of the National Shipping Corporation

Costs and benefits are computed for 30 years from the scheduled year of beginning of investment. As a result, the Internal Rate of Return is 3.8%, low from a viewpoint of ordinary evaluation. However, this project will bring not only measurable direct effects, but also extremely large indirect and spread effects, which should be considered in the evaluation of the project.

10. Administration of Mini-Port

(1) Port facilities

In order that the port functions are maintained efficiently and with fair management, it is desirable for an empowered administrative organ to take direct charge of the control and management of the port.

(2) Facilities related to fishery

It appears advisable, in respect to the nature of the operation, to commission the control and management to a local fishermen's association, to encourage the efficient utilization of the facilities and participation of fishermen.

(3) Maintenance

1) Maintenance of ice, freezing, and cold storage plant, refrigeration vessel, etc.

There is a need to assign well trained engineers to these functions and to start their training one year before the completion of the facilities.

2) Maintenance of basin and channel

According to an estimate of the volume of siltation in the channel and basin will be approximately 33,000 m^3 per year. Post-dredging conditions may modify this value.

Conclusion and Recommendation

CONCLUSION AND RECOMMENDATION

1. Conclusion

Though Gwadar is located in the area of the Baluchistan coast active in fishery, a port facility is presently unavailable and landing operations are carried out manually. For this reason, the Gwadar port development plan is one of the most important projects available to Pakistan and is essential for promoting this developing region of the Baluchistan coast.

At the proposed site, we, the Japanese Study Team, recommend the construction of a port with the following facilities: a 230 meter quay for fishing crafts; a 2 berth quay for small coastal vessels; a 1 berth quay for small oil tankers, with a water depth of 3 meters; a 100 meter quay for small fishing crafts, with a water depth of 1.5 meters; and an access channel, basin, and groin. The design also includes fishery related facilities, such as a freezing and refrigeration plant. By providing Gwadar with the above facilities, this project can contribute to the regional development of the Baluchistan coastal area, and can provide Pakistan with additional food resources.

Completion of this project will insure the supply of commodities to Gwadar, and the regional sales of fresh fish in this remote area. As a result of the development of fishing industry, the quality and quantity of fish products will improve, with a decrease in price. Not only will the standard of living of the area improve, but also a region will be available to investment by the private sector.

An economic analysis of the project, by measurement of the most probable direct benefits, indicates an Internal Rate of Return of 3.8 percent. Taking into consideration indirect and spread effects, we conclude that this project is feasible, and would be advantageous to the local population. Potential exists for gaining foreign currency by the export of fish products, and it should be considered in this project.

2. Recommendation

(1) Inducement of Fishing Industry

In this report, the development of Gwadar has been studied with respect to the two functions of the Mini-Port. The first function serves as a local fishing port, the core of the regional fishing industry. The other function is that of a commercial port, serving to provide and distribute daily commodities. Both aspects are to contribute mainly to the regional development of the Baluchistan coast.

To maximize the effect of the project, and to accelerate the regional development of Gwadar, it is desirable to induce the regional fishing industry to operate around the Mini-Port of Gwadar. Reasons include available fresh water, which has the potential to supply a new regional fishing industry; on the Baluchistan coast, Gwadar is the only city having this potential.

(2) Establishment of Mini-Port Administration

1) It is necessary to set up a new Mini-Port administrative body, which could consist of Federal and Provincial Government representatives, and local fishermen and traders.

We recommend that regular port service is insured by setting up not only a port administrative division and a service division but also a port maintenance division for facility, channel, and basin support.

There remains some problems to be discussed between the Federal Government and the Provincial Government on the assignment of personnel, the distribution of the work, and the delegation of responsiblities.

2) During the construction of the port facilities, a period of acclimatization will be required, to insure that local fishermen will be comfortable with the new operation system, as they are now accustomed to the traditional fishery methods of the region. It also will be necessary to train staff for the administration of the Mini-Port, and to train engineers for the refrigeration plant and vessel and other facilities, in order to take full advantage of the newly converted system. Organization of an administrative body to train fishermen and labourers, such as a fishermen's Cooperative, may be necessary due to the rise in value and quantity of the exportable fish product.

The Five Year Plan includes development of the fishing industry and promotion of the nation's remote regions. By improving the transportation facilities in the Baluchistan coastal region with a local port, and by construction of a fishing facility, the Gwadar Mini-Port and related projects can make significant progress towards these goals.

Chapter 1
Outline of Study

Chapter 1 Outline of Study

1-1 General

At the request of the Government of Pakistan, the Government of Japan which has a technical cooperation programme with Pakistan, decided to execute a study on the construction project of a Mini-Port in Gwadar of Baluchistan Province in the Islamic Republic of Pakistan.

The Japan International Cooperation Agency (JICA), the official agency responsible for the implementation of technical cooperation programmes, took charge of the study with the close cooperation of the Ports and Shipping Wing, Ministry of Communications, Government of Pakistan.

Pursuant to the Scope of Work, initiated by both governments in August 1978, JICA sent a study team to investigate the social, the economic and the technical matters of the region, and to summarize in a report to the Islamic Republic of Pakistan.

This study consists of selection of a site for the Mini-Port, planning the scale of the port, drafting a layout of the port facilities, estimating the construction cost, and evaluation of the economic effects of the development. The study team also conducted field surveys of the natural environment, such as meteorological, marine, and subsoil conditions, which are essential for the planning.

The study was carried out in two phases. The environmental conditions of the region varied greatly with the seasons, therefore, January, 1979 (during the NE monsoons), and July, 1979 (during the SW monsoons), was chosen for the study of the meteorological and marine conditions. In 1978, general studies were made during the 1st-phase survey, with the interim report written in February 1979. This report was reviewed in accordance with the discussion and the results of the 2nd-phase survey, and is submitted to the Government of Pakistan as the final report in 1980, after discussing the draft with the Ports and Shipping Wing in Karachi.

The study team was sent to Pakistan six times in two years. The schedule was as follows:

1st-phase 1st-survey

the first survey (Sep. 25 to Oct. 23, 1978)

1st-phase 2nd-survey

survey of meteorological and marine conditions (in NE monsoon) (Jan. 5 to Jan. 18, 1979)

2nd-phase 1st-survey

the second survey (May 25 to Jun. 22, 1979)

preparation for field survey (May 25 to Jun. 11, 1979)

2nd-phase 2nd-survey

survey of meteorological and marine conditions (in SW monsoon) (Jun. 29 to Aug. 2, 1979)

2nd-phase 3rd-survey

topographic survey and subsoil investigation (Aug. 24 to Dec. 2, 1979)

survey for design and cost estimation (Sept. 17 to Oct. 14, 1979)

2nd-phase 4th-survey

draft final report to the Government of Pakistan (Feb. 5 to Feb. 18, 1980)

1-2 Objective of the Study

The objective of this study is to design a Mini-Port capable of functioning as a fishing port in Gwadar, where no port facility is available presently. This project is intended to contribute to the promotion of fishery, a key goal of the regional development programme in Baluchistan Province, Pakistan.

1-3 Agencies and Places Visited

The Japanese Study Team visited following agencies and places for collecting information and data.

- Federal Government
  - Ministry of Communications, Ports and Shipping Wing
  - Ministry of Finance
  - Planning Division
  - Economic Affairs Division
  - Statistics Division
  - Ministry of Food and Agriculture, Marine Fisheries Department
- Provincial Government
  - Government of Baluchistan, Department of Fisheries
  - Government of Sind, Department of Fisheries
- Karachi University
- Other related Agencies
  - Karachi Port Trust
  - Public Works Department
  - National Shipping Corporation
  - Governmental branches in Gwadar
- Private Sectors
  - Engineering consultants
  - Contractors
  - Forwarding agents
- Related Places
  - Quetta
  - Jiwani
  - Gadani

Other related agencies and locations were also visited.

1-4 Organization of Study Team

1-4-1 Japanese Study Team

The study was carried out in two years, namely in 1978 (1st-phase) and in 1979 (2nd-phase).

The study at the 1st-phase was conducted by the Overseas Coastal Area Development Institute of Japan (OCDI). The members of the team were as follows:

Name	Duty	Period Sent
Minoru Soya	Leader, Port (fishing port) planning	1
Masaaki O'hashi[1)]	Economic effect of development	1
Ryuji Koh	Coastal engineering	1, 2
Katsuhiko Ohno	Soil engineering, Design	1, 2
Takao Saito	Fishery related facilities planning, Cost estimation	1

The study at the 2nd-phase was conducted by a joint venture of OCDI and Kiso-Jiban Consultants Co., Ltd. OCDI was in charge of general planning, and Kiso-Jiban executed subsoil investigation, topographic survey, and material reconnaisance.

The members of the team were as follows:

OCDI

Name	Duty	Period Sent
Minoru Soya	Leader, Port (fishing port) planning	3, 7
Ryuji Koh	Coastal engineering	3, 4, 7
Hideo Kataoka	Marine condition survey	3, 4
Tsuneji Kikuchi	Marine condition survey	4
Masataka Takahashi	Economic effects	3
Katsuhiko Ohno	Structural design	3, 6
Takao Saito	Construction plan, Cost estimation	6, 7

Kiso-Jiban Consultants

Name	Duty	Period Sent
Satoru Sone	Sub-leader, Geotechnology	3, 5
Kumpei Tanigawa	Site manager, Geotechnology	5
Hisashi Fukuzawa	Material recennaissance	5
Kunio Sugaya	Drilling	5
Teruo Sugaya	Drilling	5
Tsutomu Kusaka	Topographic survey	5
Fukuo Mizuno	Topographic survey	5
Takashi Kitajima	Topographic survey	5
Mizuho Nagaya	Topographic survey	5

Period Sent

1: Sep. 25 to Oct. 23, 1978
2: Jan. 5 to Jan. 18, 1979
3: May 25 to Jun. 22, 1979
4: Jun. 29 to Aug. 2, 1979
5: Aug. 24 to Dec. 2, 1979
6: Sep. 17 to Oct. 14, 1979
7: Feb. 5 to Feb. 18, 1980

1) Member of JICA

1-4-2 Pakistani Counterparts

Following members joined the study as counterparts from the Ports and Shipping Wing, Ministry of Communications.

Name	Position
Capt. L Jackson, Rtd. PN.	Joint Secretary/Director General
Mr. Anwar Khan	Director of Ports & Administration
Mr. Sahibdad Mengal	Project Director, Gwadar Fish Harbour
Mr. Shamsuddin	Section Officer
Mr. Naseer Ahmed	Assistant Executive Engineer, Gwadar Fish Harbour Project
Mr. Mohd Hassan	Administrative Officer

Chapter 2
Background and Progress of the Project

Chapter 2 Background and Progress of the Project

2-1 Background of the Project

Pakistan is divided into the four provinces of Punjab, Sind, the Northwest Frontier, and Baluchistan, with Baluchistan the least developed. The fifth Five Year Plan, started in 1978 by the Government of Pakistan, calls for the development of backward areas as one of its most important policies. The Plan is placing particular emphasis on the development of Baluchistan Province.

In addition, the Government is also planning to increase the consumption of fish by the people, a substitute protein to replace animal meat and poultry, which is becoming scarce. Furthermore, fish is an important commodity of export for Pakistan, and the Government is exerting further efforts for promoting its fishing industry.

Under these circumstances, construction of a Mini-Port in Gwadar was recognized by the Federal Government as an important project, and corresponds to National goals, by promoting fishery and starting the development of Baluchistan Province. Thus, in 1976, this project was transferred to the Federal Government from the Provincial Government, which had been in charge of the plan.

2-2 Outline of Gwadar

(1) Location

Gwadar is a small provincial city near the west end of the Makran Coast, in the south part of Baluchistan Province, about 470 km west of Karachi (25°07″N, 62°19″E).

Facing the Arabian Sea, the city is a core of the active fishing on the coastal region. Inland of Gwadar is a desolate desert zone with few towns and villages.

(2) Governmental Agencies

In Baluchistan Province, Gwadar is second in population to Quetta, the capital city, with its branches of Federal and Provincial Government, as shown in Fig. 2-1 and 2-2. The Gwadar Fish Harbour Project Office, part of the Ports and Shipping Wing, Ministry of Communications, is near to the Headquarters of the Pakistan Coast Guards. On the west coast, the site of the New Gwadar Fish Harbour Colony is located, where a guest house and residences for staff are under construction. But this work has been suspended since June of 1976.

There are trees of plantation along the road from the town to the airport by the branch office of the Forest Department.

(3) Transport

Buses and trucks running on the shingle road are the principal transportation of this region. The road connects Gwadar with Karachi and surrounding towns, but three days are required between Gwadar and Karachi by bus because the road is very rough. In Gwadar there are 171 automobiles and autobicycles, many of Japanese make. Their division is: 9 buses, 34 trucks (including 6 tank rollies), 19 jeeps (14 Toyota and 5 Willis), and 109 autobicycles.

The airport is located at 10 km north of the city center, with daily flight service to Karachi provided by Pakistan International Airlines (PIA).

(4) Commodities

Fishing is Gwadar's only appreciable industry, with agriculture nonexistent, so most commodities have to be transported from Karachi using irregular coastal ships of the National Shipping Corporation (NSC), and trucks. However, in the absence of a berthing facility, the goods are transferred offshore onto small boats, brought to the beach, and carried ashore. Consequently, prices of commodities are more than two times higher than in Karachi.

Most construction materials are transported by truck from Karachi, with a premium of 7 to 8% added to the unit price. Neither construction equipment nor skilled labourers are available, even an unskilled labour force does not exist.

(5) Electricity

Electric power is supplied from a power plant with a 200 KW and 100 KW generator. It is in service for a total of 16 hours per day; 5:00–7:00, 9:00–18:00, 19:30–0:30 (June, 1979). 24 hour service is not possible as spare parts are not available. The scheduled service changes with variable weather conditions. At present, 700 houses are supplied with power, and additional 200 to 300 houses are soon to have the service installed. Kerosene lamps are used in the areas without electricity. At present a new plant is under construction, that will accommodate four 200 KW generators to meet the demand of Gwadar City. With the foundation not yet complete, the generators have not been installed.

Electric charge per unit is Rs. 0.6 up to 40 units and Rs. 0.03 over 40 units for commercial use, and Rs. 0.29 up to 20 units and Rs. 0.03 over 20 units for domestic use (1 KW is equivalent to 36 units). Consumption of fuel oil for the power generator is about 0.5 kilolitres per day.

(6) Water Supply

Gwadar has a freshwater resource in the Dasht River, about 81 km away, with a flow rate of 150,000,000 m^3 per year and a pondage of 230,000 m^3. 600 to 700 cubic meters per day of freshwater are delivered through a pipe line, controlled by the Irrigation Department. In addition, a desalination plant utilizing solar energy produces 18 cubic meters of potable water per day. Wells at various places can also draw groundwater.

The freshwater is free of charge. Branching from the main pipe costs 10 rupees per month per house, with 380 houses supplied with this service at present. Other people may draw freshwater from tanks at the service station at the center of the city. In addition, a water transportation service is available, to deliver water in containers from donky carts, at one rupee for the delivery of 18 litres.

A new water supply plan (Storage-1) is designed to meet the increased demand of this area, and is scheduled to be completed by June 1980. Design quantity of water supply is 45 litres per person per day, or 600 cubic meters per day for 13,000 persons.

Since pipes which have been laid already near the proposed site of the port do not have enough capacity, there is a need to lay larger pipes from the service station to the port site, with a diameter of 3 to 4 inches. It is said that the Government of Pakistan has a plan for this system at present.

(7) Fuel Oil

There are five oil stations in this city; three of them are in service now. In Pakistan, oil is a controlled commodity, sold at the same fixed price throughout the country, with the cost of transportation included in the price. Pakistan Station Oil Co. (PSO) sells oil exclusively.

(8) Civilian Life

The bazaar, in the center of the city, is bustling with several banks, restaurants, grocery stores, barbershops, clothing stores, condiment stores, drug stores, cinema halls, and other various shops.

It is said that 85% of the inhabitants in Gwadar pay for some taxes. The type of taxes include an income tax, a fixed asset tax on land and dwellings, a market tax, a ship tax, a tobacco tax, an entertainment tax, and others.

According to the report of Gwadar's hospital, there are many patients of trachoma, dengue, malalia and other diseases. The incidence of eye disease is high among fishermen, who account for about a quarter of all patients with that disease.

2-3 Past Development Studies

Except the Karachi Fishing port, the fishing ports in Pakistan are not noteworthy in scale or in facility. Thus, the need for small fishing ports along the Makran Coast, including Gwadar, has been recognized since early times, and a number of feasibility studies have been carried out. Development of a large fishing port such as the Karachi Fishing Port was assumed by the Federal Government, while the responsibilities for development of small fishing ports was assumed by the respective Provincial Governments; the Gwadar Port Development Project was undertaken by the Provincial Government in 1967.

The major studies conducted on the Gwadar Port Development Project are shown below:

i) Economic & Engineering Feasibility Study for a Second Port in West Pakistan, by M/s. Lackner & Zafar (1967);

ii) Makran Coast Fisheries, Economic & Engineering Feasibility Study for Fish Harbour along Makran Coast, by M/s. William Halcrow and Incorporated Consulting Engineers (1968);

iii) Problems Related to Development of Fish Harbour along Makran Coast, by ASCON (1969);

vi) Establishment of a Port on Makran Coast, Prefeasibility Report, by Techno-Consult, Consulting Engineers (1974); and

v) Preliminary Planning Report, by National Engineering Service (Pakistan) Ltd. (1977).

In addition to the foregoing studies, surveys of soil condition, construction materials, etc., were executed.

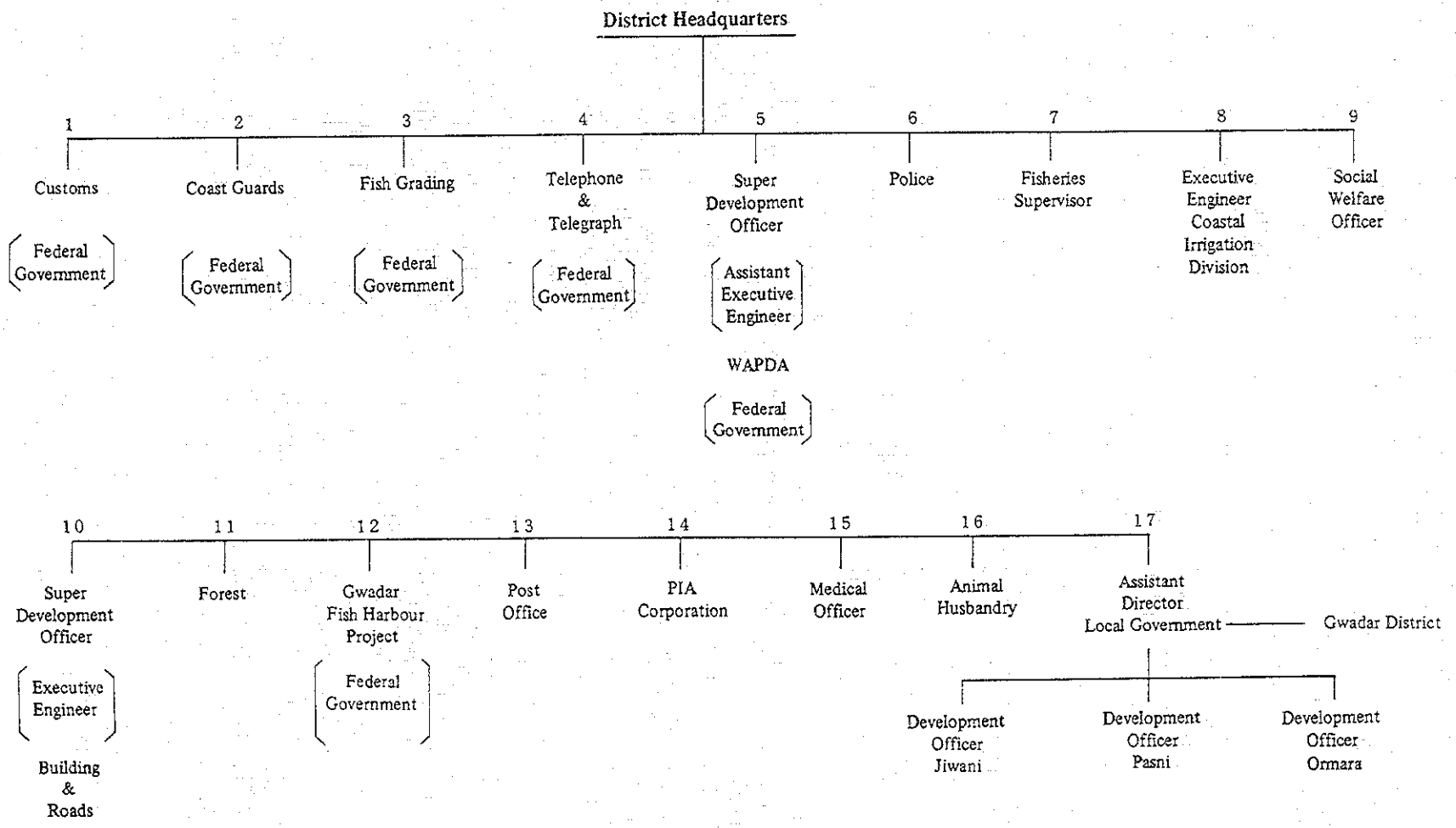
While the past studies were conducted by the Federal or Provincial Government, the present survey is carried out for the first time by the Japanese Government on the bilateral technical cooperation.

Fig. 2-1
Organizational Chart
of
Divisional Commissioners
and
Deputy Commissioners in Baluchistan

Quetta Division	Kalat Division	Makran Division	Sibi Division
1. D.C. Quetta	1. D.C. Khuzdar	1. D.C. Turbat	1. D.C. Sibi
2. D.C. Pishin	2. D.C. Kalat	2. D.C. Gwadar	2. D.C. N'abad
3. D.C. Loralai	3. D.C. Kharan	3. D.C. Panjgur	3. D.C. Kachhi
4. P.A. Zhob	4. D.C. Lasbela		4. P.A. Kohlu
5. P.A. Chagai			

Note: D.C.: Divisional Commissioner
P.A.: Political Agent
Source: Government of Baluchistan

Fig. 2-2 Management / Administration



Source: Government of Baluchistan

Chapter 3
Basic Concept for Mini-Port Development

Chapter 3 Basic Concept for Mini-Port Development

3-1 General

Acting on the request of the Government of Pakistan, the target year of 1983 is set, coinciding with the target year of the Five Year Plan. In this chapter is described the necessity and the character of the Mini-Port, to both improving the city of Gwadar and to increase the fishery of the region through the target year.

3-2 Necessity of Mini-Port

Presently, Gwadar has no landing or port facility, with the natural seashore used for landing and for unloading of fishing catch. Nevertheless, the fishing activities are carried out extensively, and the catch at Gwadar in 1978 was 24,125 tons. These catches represent 37 percent of the total fishery along the whole coastal area of Baluchistan, amounting to 65,906 tons in 1978. However, in the absence of any fishery related facilities, such as a fish market or cold storage and refrigeration plant, the catches are mainly processed into dried fish and dry salted fish by sun drying, although some iced shrimps and fish, dry shrimps and dry salted fish are forwarded to Karachi. Presently, there is one small ice plant and a fish curing yard. Thus, the products are not of high quality, and result in a low income of the fishermen. In addition, the fishermen are unable to regularly renew their equipment, and are constrained to using small scale fishing methods.

Fish and shrimp products contribute greatly to foreign trade exports, and further growth of this industry is expected. However, the Baluchistan coast, including Gwadar, has traditionally exported dry salted fish to Sri Lanka, but now that country is moving towards an independent policy of self-support, using their own fishing fleets to reduce purchases of foreign products. For this reason, further growth of the export of dry salted fish is not expectable. In addition, the dry salted fish are not of high quality, and thus the export price is by no means high. Unless the product quality is improved, any increase in fishing income cannot be expected. Therefore, priority to production of frozen and/or iced fish and shrimp is essential in the future.

Gwadar is a desert city with little agriculture except dates, and most commodities must be transported by land or by sea from Karachi. However, because there is no landing facility, quaywall cargo handling is not available for the small coastal launches.

There has been a long time need to improve the existing situation, and thus raise the productivity of the fishing industry and secure a reliable supply of good quality marine products. At the same time, the increase of the country's exports, and the improvement of the standard of living of the regional fishermen is a national goal. For these reasons, it is important and urgent to provide Gwadar with landing facilities and with fishery related facilities of a suitable scale, and thus contribute to the development of the regional society.

Once such a Mini-Port is constructed, steps should be taken to optimize the success of the development, by providing public infrastructures for Mini-Port management, and by attracting investment of related private enterprises by using the Mini-Port as a trigger, thus comprehensively improving the Gwadar area.

3-3 Character of Mini-Port

When the geographically isolated location of Gwadar is considered, two functions of the Mini-Port are important. The first is as a fishing port, having the function of a strategic point of the regional activities; the other is as a distribution port, serving the area as a transportation centre for daily commodities and fishery products. Thus, the Mini-Port location is ideally positioned as the regional hub of coastal fishery, and at the same time, a strategic point for regional development based on fishery related industries.

Chapter 4
Present Situation of Related Area to Mini-Port

Chapter 4 Present Situation of Related Area to Mini-Port

4-1 General

This chapter describes the location of Baluchistan Province in Pakistan as well as the current economic factors at Gwadar, where the Mini-Port is planned.

4-2 Population

Baluchistan Province is approximately 347,000 km^2 large, as shown in Table 4-1. Its area is the largest among all the provinces and accounts for 44% of the nation's land, 796,000 km^2. According to the 1972 census, however, its population was 2.43 million people, which is slightly less than 4% of the whole Pakistani population of 65.31 million. The population density in Baluchistan is only 7 persons/km^2, far less than the other provinces.

Table 4-2 shows the populations of the whole country, Baluchistan Province, the Makran Coast and Gwadar. The population of Gwadar given in the table is limited only to Gwadar City. If the population in peripheral regions, such as Sur, is included, the estimated population of Gwadar was 30,000 in 1973, 40,000 in 1978, and will be 45,000 in 1981, according to the estimate of the city authorities (see Table 4-3 and Fig. 4-1).

The average annual increase of population in Baluchistan Province is higher than the national average, and it is especially high along the Makran Coast, reflecting the rapid growth of fishery activities. The increase in Gwadar also has been as high as 4.55% per year.

The labour force of the country has remained almost unchanged between 1977 and 1978, as shown in Table 4-4. Fishermen have been increasing, but the number of those engaged in inland water fishing is approximately 130,000, and accounts for 57% of the total fishermen (228,000 persons). The number of those engaged in marine fishery also shows an increasing tendency, though with some fluctuations. However, this can be accounted for in the increase of marine fishermen in the Karachi and Sind coasts, while the total number of fishermen along the Baluchistan coast has been decreasing. It reached a peak (about 44,000 persons) in 1967 but has been decreasing since then, becoming even more severe since 1976. The decrease of fishermen seems attributable to the large demand for labourers in the Middle East during the recently years; this also is reflected in the scarcity of labour forces in Baluchistan Province. Marine fishermen of the Karachi and Sind coasts and those of the Baluchistan coast are at a ratio of 4:1 in 1978.

Table 4-6 gives the number of fishermen in each region, and for each type of labour in Baluchistan coast. It shows that fishermen are increasing in the three western regions, namely, Jiwani, Gwadar, and Pasni, although the total number of fishermen along the Baluchistan coast has been decreasing every year. The decrease of fishermen was large in some years in Ormara and Sonmiani, and this has influenced the figures on the entire Baluchitan coast. The figures classified by labour type show that "Other Fishermen," who are fishermen engaged in secondary or tertiary industries related to fishery, are increasing in all the areas, and the fishermen in Gwadar increased from 5,671 persons in 1976 to 6,351 persons in 1978, a 12% increase. Table 4-2 shows that the population of Gwadar was 19,727 in 1977, and that the fishermen's population was 6,297 persons, equivalent to 32% of the city population. These figures clearly show that living is based on fishery in Gwadar.

4-3 Gross Domestic Product (GDP)

Table 4-7 and 4-8 show GDP/GPP (Gross Provincial Product) of Pakistan and Baluchistan Province, respectively. Generally, the ratio of agriculture to the total of GDP/GPP is 32% to 36% and 41% to 45%. This shows that the weight of the agricultural sector is slightly higher in Baluchistan Province. On the other hand, fishery accounts for only 0.4 to 0.6% of the GDP in the whole country, but 4% of the GPP in Baluchistan Province. In other words, the fishery sector makes a large contribution to GPP in this province. At the same time, the contribution of secondary industries, such as manufacturing industry, is small in Baluchistan Province than in the whole country.

The per capita national income in Pakistan was Rs 2,165 in 1977/78. However, the per capita provincial income in Baluchistan Province was approximately one half of the national level.

4-4 Production

The products in Baluchistan Province are shown in Table 4-9 and 4-10. The amount of production is extremely low in Baluchistan, compared with the other provinces.

The only industries in Gwadar consist of fishery and fishery related services. As described in detail in Chapter 5, dry salted fishery products are exported directly from Gwadar to Sri Lanka, and sharks' fins and other processed fish products are exported to Europe by way of Karachi. Gwadar has no other special industry.

Table 4-1 Area, Population and Density of Pakistan by Province

Locality	Area (km^2)	Population 1961 (1,000)	Population 1972 (1,000)	Percentage increase (%)	Density 1972 (persons/km^2)	Share of population 1972 (%)	Share of Area (%)
Pakistan	796,095	42,880	65,309	52.3	82	100	100
Male		22,960	34,833	51.7			
Female		19,920	30,476	53.0			
N.W.F.P.	74,522	5,731	8,389	46.2	113	12.9	9.4
Male		2,986	4,363	46.1			
Female		2,745	4,026	46.7			
F.A.T.A	27,221	1,847	2,491	34.9	92	3.8	3.4
Male		969	1,266	30.6			
Female		878	1,255	39.5			
Punjab*	206,252	25,582	37,845	47.9	183	57.9	25.9
Male		13,644	20,340	49.1			
Female		11,938	17,505	46.6			
Sind	140,913	8,367	14,156	69.2	100	21.7	17.7
Male		4,618	7,574	64.0			
Female		3,749	6,582	75.6			
Baluchistan	347,188	1,353	2,428	79.5	7	3.7	43.6
Male		743	1,289	73.5			
Female		610	1,139	86.7			

Note: 1) * denotes the figures including the population of Federal Capital Territory of Islamabad.
2) N.W.F.P denotes North West Frontier Province
3) F.A.T.A denotes Federally Administered Tribal Areas.

Source: Statistical Pocket-Book of Pakistan 1978 Statistics Div. Government of Pakistan.

Table 4-2 Population by Area

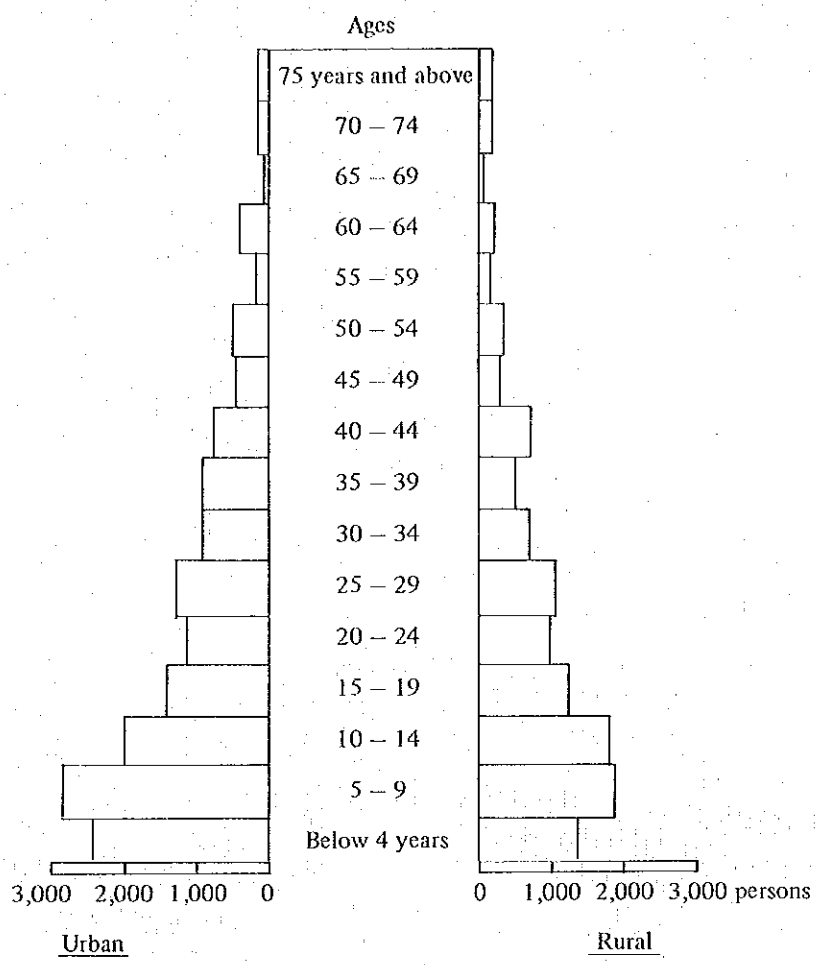
Year	Pakistan Federal (x 1,000)	Baluchistan Province (x 1,000)	Baluchistan Makran Coast	Gwadar
1961	1) 42,880	2) 1,353	3) 150,628	2)3) 8,146
1972	1) % 65,309 (3.90)	2) % 2,428 (5.46)	3) % 304,010 (6.59)	2)3) % 15,794 (6.20)
1977	1) 73,430 (2.37)	4) 2,865 (3.36)	4) 388,050 (5.00)	4) 19,727 (4.55)
5) 1983	4) 86,900			

Sources & Remarks

1) Pakistan Economic Survey 1977/78, Finance Div. Economic Advisor's Wing
2) Development Statistics of Baluchistan Province, Government of Baluchistan, Planning & Development Dept. 1975/76.
3) District Census Report of Makran 1972, Ministry of Interior, States & Frontier Regions
4) Estimate
5) The Fifth Five Year Plan (1978–83), Planning Commission, June 1978.

Note: ( ) denotes annual growth rate of population.

Fig. 4-1 Population of Gwadar
(Age Groups 1972 Census)



Source: "Population Census of Pakistan 1972" District Census Report Makran.

Table 4-3 Population of Gwadar by Area

(Unit: in persons)

Area	1961 Census	1972 Census	Growth Rate (%/yr.)
Gwadar	14,304 (100%)	27,473 (100%)	5.7
Urban	8,146 (56.9)	15,794 (57.5)	5.7
Rural	6,158 (43.1)	11,679 (42.5)	5.7

Source: "Population Census of Pakistan 1972" District Census Report Makran.

Table 4-4 Labour Force by Sector and Area

Year	Total (x 1,000)	Agro-fishry Total (x 1,000)	Fishermen	Fishermen	
				Engaged in Marine	Worked in Baluchistan Coast
1961	1) 28,897	2) 15,422	4) 110,000	4) 66,000	4) 17,000
1972	1) 44,012 (3.90) %	3) 25,342 (4.02) %	4) 176,720 (4.40) %	4) 93,825 (3.28) %	4) 28,600 (4.84) %
1977	1) 49,484 (2.37)	5) 29,190 (2.86)	4) 217,173 (4.21)	4) 92,836 (△0.21)	4) 17,636 (△10.15)
1978	6) 49,400 (△0.17)	29,146 (△0.15)	4) 228,410 (5.17)	4) 98,227 (5.81)	4) 17,427 (△1.20)

Sources & Remarks:

1) 67.39% for Total Population, according to Statistical Pocket-Book 1978, Statistics Div.
2) 53.37% for Total Labour Forces, according to Pakistan Statistical Year-Book 1977, Statistics Div.
3) 57.58% for Total Labour Forces, the same as 2)
4) Hand-Book of Fishery Statistics of Pakistan 1978. Marine Fisheries Dept.
5) Estimate
6) The Fifth Five Year Plan (1978–83) Planning Commission, June 1978.

Note: ( ) denotes annual growth rate of labour force.

Table 4-5 Fishermen Engaged in Marine and Inalnd Fisheries (1959 – 1978)

Year	Marine			Inland	Total
	Karachi and Sind Coasts	Baluchistan Coast	Total		
1959	37,590	13,936	51,526	38,000	89,526
1960	44,438	15,785	60,223	40,000	100,223
1961	49,000	17,000	66,000	44,000	110,000
1962	49,900	17,655	67,555	44,000	111,555
1963	50,898	17,800	68,698	44,000	112,698
1964	51,957	17,961	69,918	44,000	113,918
1965	52,153	17,961	70,114	44,000	114,114
1966	53,455	18,720	72,175	44,000	116,175
1967	55,166	19,486	74,652	44,000	118,652
1968	56,820	24,726	81,546	48,292	129,838
1969	58,240	43,772	102,012	53,772	155,784
1970	61,000	28,600	89,600	73,180	162,780
1971	62,520	28,600	91,120	72,878	163,998
1972	65,225	28,600	93,825	82,895	176,720
1973	70,770	25,200	95,970	87,237	183,207
1974	72,000	25,200	97,200	100,984	198,184
1975	73,500	25,200	98,700	108,597	207,297
1976	74,100	17,868	91,968	113,903	205,871
1977	75,200	17,636	92,836	124,337	217,173
1978	80,800	17,427	98,227	130,183	228,410
	(82%)	(18%)	(100%)		

Source: "Hand Book of Fisheries Statistics of Pakistan 1978" Marine Fisheries Department, Government of Pakistan

Table 4-6 Fishermen Engaged in Fishing Industry on Baluchistan Coast by Area (1976 to 1978)

(Unit: in number of persons)

Category of Fishermen	Year	Jiwani Area	Gwadar Area	Pasni Area	Ormara Area	Sonmiani Area	Total
Fulltime fishermen	1976	968	3,961	2,325	1,374	3,886	12,514
	1977	992	4,236	2,418	1,374	1,992	11,012
	1978	1,001	4,265	2,496	1,374	2,014	11,150
Part-time fishermen	1976	145	550	575	465	200	1,935
	1977	159	610	640	465	340	2,214
	1978	162	620	690	35	356	1,863
Occasional fishermen	1976	50	500	320	145	100	1,115
	1977	60	725	367	153	522	1,827
	1978	62	730	384	20	540	1,736
Other fishermen engaged in secondary and tertiary fish industry	1976	390	660	387	246	621	2,304
	1977	475	726	478	246	658	2,583
	1978	485	736	527	246	684	2,678
Total	1976	(100) 1,553	(100) 5,671	(100) 3,607	(100) 2,230	(100) 4,807	(100) 17,868
	1977	(108.56) 1,686	(111.04) 6,297	(108.20) 3,903	(100.36) 2,238	(73.06) 3,512	(98.70) 17,636
	1978	(110.11) 1,710	(111.99) 6,351	(113.58) 4,097	(75.02) 1,675	(74.77) 3,594	(97.53) 17,427

Source: Directorate of Fisheries, Government of Baluchistan.

Note: ( ) denotes percentage to the year of 1976.

Table 4-7 GDP/GPP and Fishing Industry in Federal Pakistan & Baluchistan Province

(Current Factor Cost)

Factors	1972/73 (Rs. 1,000) Federal 1)	%	1972/73 (Rs. 1,000) Baluchistan 2)	%	73/74 (Rs. 1,000) Federal 1)	%	73/74 (Rs. 1,000) Baluchistan 2)	%
Agriculture	21,907,000	(36.2)	5,040	(41.2)	28,084,000	(35.2)	6,499	(45.0)
Crops	15,179,000	(25.1)	2,641	(21.6)	19,108,000	(24.0)	3,433	(22.7)
Livestock	6,169,000	(10.2)	1,891	(15.4)	8,247,000	(10.3)	2,421	(16.0)
Fishing	379,000	(0.6)	501	(4.1)	476,000	(0.6)	636	(4.2)
Forestory	180,000	(0.3)	7	(0.1)	253,000	(0.3)	9	(0.1)
Mining & Quarrying	386,000	(0.6)	595	(4.9)	560,000	(0.7)	714	(4.7)
Manufacturing	9,415,000	(15.6)	386	(3.2)	12,271,000	(15.4)	477	(3.2)
Construction	2,298,000	(3.8)	552	(4.5)	3,114,000	(3.9)	701	(4.6)
Electric & Gas	955,000	(1.6)	71	(0.6)	1,217,000	(1.5)	83	(0.5)
Transport, Storage & Comm.	4,275,000	(7.1)	1,406	(11.5)	5,585,000	(7.0)	1,870	(12.4)
Wholesale & Retail Trade	8,490,000	(14.1)	1,177	(9.7)	12,183,000	(15.3)	1,565	(10.3)
Banking & Insurance	1,408,000	(2.3)	681	(5.6)	1,801,000	(2.2)	865	(5.7)
Ownership of Dwellings	2,237,000	(3.7)	69	(0.6)	2,868,000	(3.6)	88	(0.6)
Public Administration & Defense	4,430,000	(7.3)	1,170	(9.6)	5,750,000	(7.2)	1,404	(9.3)
Services	4,636,000	(7.7)	677	(5.6)	6,363,000	(8.0)	867	(5.7)
GDP	60,437,000	(100)			79,796,000	(100)		
GPP (Gross Provincial Product)			12,210	(100)			15,133	(100)
Per Capita Gross Income (Rs.)	933		507		1,197		596	

Sources: 1) Pakistan Statistical Yearbook 1977 Statistics Div., Government of Pakistan.
2) Development Statistics Baluchistan Province, Government of Baluchistan.

Table 4-8 GDP and Fishing Industry in Federal Pakistan

(Current Factor Cost)

Factors	1974/75 1) (Mil. Rs)	75/76 1) (Mil. Rs)	76/77 1) (Mil. Rs)	77/78 2) (Mil. Rs)
	%	%	%	%
Agriculture	33,533 (32.4)	38,338 (32.0)	43,512 (32.7)	49,422 (32.4)
Major Crops	18,268 (17.7)	20,572 (17.2)	22,484 (16.9)	27,064 (17.7)
Minor Crops	5,003 (4.8)	6,030 (5.0)	6,963 (5.2)	7,856 (5.2)
Livestock	9,629 (9.3)	11,130 (9.3)	13,261 (10.0)	13,518 (8.9)
Fishing	383 (0.4)	447 (0.4)	512 (0.4)	680 (0.4)
Forestry	250 (0.2)	159 (0.1)	292 (0.2)	304 (0.2)
Mining & Quarrying	793 (0.8)	968 (0.8)	1,250 (0.9)	1,232 (0.8)
Manufacturing	16,618 (16.1)	18,831 (15.7)	20,574 (15.5)	22,735 (14.9)
Construction	4,996 (4.8)	6,739 (5.6)	7,376 (5.5)	8,442 (5.5)
Electric & Gas	1,264 (1.2)	1,713 (1.4)	2,061 (1.6)	2,504 (1.6)
Transport, Storage & Comm.	7,402 (7.2)	8,329 (7.0)	9,119 (6.9)	10,983 (7.2)
Wholesale & Retail Trade	15,893 (15.4)	17,940 (15.0)	19,472 (14.7)	22,277 (14.6)
Banking & Insurance	2,612 (2.5)	3,021 (2.5)	3,571 (2.7)	4,060 (2.7)
Ownership of Dwellings	3,766 (3.6)	4,356 (3.7)	4,930 (3.7)	5,484 (3.6)
Public Administration & Defense	8,113 (7.8)	9,322 (7.8)	10,271 (7.7)	12,091 (7.9)
Services	8,514 (8.2)	10,085 (8.5)	10,702 (8.1)	13,342 (8.8)
GDP	103,504 (100)	119,642 (100)	132,838 (100)	152,572 (100)
Per Capita Gross Income (Rs)	1,512	1,720	1,884	2,165

Source: 1) "Pakistan Statistical Yearbook 1977" Statistics Div., Government of Pakistan.
2) "National Accounts of Pakistan 1974/75 – 77/78" Statistics Div., Government of Pakistan.

Table 4-9 Production of Selected Crops by Province

(Unit: million tons)

Items	Year	Pakistan	Punjab	Sind	N.W.F.P	Baluchistan
Rice	1974/75	2.32	1.15	1.05	0.08	0.04
	75/76	2.62	1.21	1.29	0.08	0.04
	76/77	2.74	1.33	1.29	0.09	0.03
Wheat	1974/75	7.67	5.79	1.14	0.61	0.13
	75/76	8.69	6.57	1.32	0.66	0.14
	76/77*	–	–	–	–	–
Maize	1974/75	0.75	0.33	0.01	0.41	–
	75/76	0.80	0.39	0.01	0.40	–
	76/77	0.76	0.36	0.01	0.39	–
Sugar-cane	1974/75	21.24	14.81	2.77	3.66	–
	75/76	25.55	18.27	3.59	3.69	–
	76/77	29.38	21.64	4.04	3.70	–

Source: Statistical Pocket-Book of Pakistan 1978 Statistics Division, Government of Pakistan.
* means not available.

Table 4-10 Production of Selected Minerals by Province

(Unit: thousand tons)

Items	Year	Pakistan	Punjab	Sind	N.W.F.P	Baluchistan
Lime stone	1974/75	2,458	165	2,285	8	–
	75/76	3,249	1,137	2,111	1	–
	76/77	3,288	958	2,329	1	–
Gypsum	1974/75	599	582	6	11	–
	75/76	300	284	4	12	–
	76/77	287	281	1	5	–
Rock salt	1974/75	404	348	–	56	–
	75/76	427	377	–	50	–
	76/77	336	276	–	60	–
Argonite/marble	1974/75	36	–	–	3	33
	75/76	35	–	–	15	20
	76/77	35	–	–	8	27
Gravel	1974/75	66	–	59	–	7
	75/76	46	–	46	–	–
	76/77	41	–	37	–	3

Source: Statistical Pocket-Book of Pakistan 1978 Statistics Division, Government of Pakistan.

Chapter 5
Present Situation of Fishery

Chapter 5 Present Situation of Fishery

5-1 General

With rich fishing grounds located around Pakistan, the fishing activities are carried out extensively. In this chapter, the present situation of marine fisheries in Pakistan is described.

5-2 Fishery in Pakistan

5-2-1 Outline

It is said that small school fish, such as sardine, anchovy, and mackerel, form large resources in some places of the Indian Ocean, the Arabian Sea, and other areas where the fishing is not intense. Also, it is possible that shallow sea fish in the northern Arabian Sea are promising species for fishery, as they are distributed on the continental shelf off Pakistan. In the area along the Makran Coast extending for about 600 km, there are reportedly more than 100 species of fish as illustrated in Appended Table A 5-1.

Fish is the food rich in protein, mineral, and vitamins, and can provide an important source of animal protein to people. However, in Pakistan, refrigeration equipment, and effective transportation systems required for supplying fresh fish to the inland areas, are not always available, so that the intake of fish by people is still at a very low level (1.6 kg per capita average). The quantity of fish exported is also great, and as a general trend, there is an increasing demand for fish.

5-2-2 Catches

Catches have been increasing remarkably in the last ten years, as shown in Appended Table A 5-2. In a breakdown of the total fish catch of 1978, the marine fishery accounts for 88%, with the Baluchistan coast constituting only 23%, and the Karachi and Sind coasts constituting the greater part at 65%. The catches for three years, from 1976 to 1978, broken down into subsistence catches, and commercial and industrial catches, are shown in Table 5-1. The handling for commercial and industrial fishery in the Baluchistan coast in 1978 was 65,096 tons, with fish accounting for 62,717 tons, and shrimp for 2,379 tons, as shown in Table 5-2. Classifying the marine fish catch of 293,000 tons in Pakistan according to human consumption and industrial use, it is shown that the former is 48.5%, at 142,000 tons, while the latter is 51.5%, at 151,000 tons (see Appended Table A 5-3). Making a further breakdown of fish used for human consumption and shrimp, fish were 45.5% of the catch, and shrimps were 90% of the catch. Edible fish is taken by gill net generally, while the fish used for livestock feed and fertilizer is most often taken by trawler.

5-2-3 Utilization of Catches

The commercial and industrial catch of fish is utilized in the following ways:

Marketed fresh
Frozen
Canned
Cured
Reducted to fish meal

Of the 1978 catch, totaling 68,346 tons, the Baluchistan coast consumed 24% in the form of fresh fish, processed 3% for frozen products, 36.3% for dry fish and dry salted fish, 21.9% for fish meal, 4.8% for fishermen's subsistence use, and 10.4% for other purposes (see Appended Table A 5-4). When compared with the Karachi and Sind coasts, the Baluchistan coast lacks modern processing facilities, resulting in a large quantity of sun dried products. On the other hand, the share of local consumption of fresh fish has been increasing year by year. The proportion of domestic consumption to that of commercial and industrial catch was about 3:2, with domestic consumption increasing (see Appended Table A5-5).

5-2-4 Fishing Crafts

Along the Pakistan coast, the trend of motorization of the fishing crafts in the marine fishery is remarkable, and in 1978, powered boats constitute 35%, or 3,175 boats, of the total 9,039. By area, the Karachi and Sind coasts have 2,456 powered boats, 37% of a total 6,647 boats, while the Baluchistan coast has 719 powered boats, 30% of a total 2,392 boats (see Appended Table A 5-6). Since 1975, there has been a trend of powered sailing boats, and this trend is likely to continue. A centre mounted outboard motor, with a long shaft, is used for propelling the sail boats. The small horsepower outboard motors are imported mainly from China, America, Italy and Japan. They are of the engine power of 3 to 14 B.H.P. and use kerosene as fuel.

5-2-5 Fishermen

Fishermen engaged in the marine fishery are less than those engaged in freshwater fishery, and were at 98,227 in 1978, as shown in Table 4-5. Among the marine fishermen, those working along the Baluchistan coast were 17,427, or only 18% of the total. However, when the catch per fisherman in the Baluchistan coast is compared with that in the Karachi and Sind coasts, the Baluchistan fisherman catches 3.9 tons/year, while the other fisherman 2.3 tons/year, a greater catch ratio of almost 2 times. This result shows high productivity of fishery on Baluchistan coast.

5-2-6 Export of Fish Products

The fishery situation in Pakistan in recent years are shown in Appended Tables A 5-7 to A 5-12. Based on the records of 1978, the following characteristics are seen.

The exports of fish in 1978 were 29,186 tons, a figure less than the previous year. When the unit price per ton (by the kind of processed product) is studied, the table shows that the unit

prices of shellfish and sharks' fins are high. Shellfish was 5,802 tons, or 20%, of the total exports, but occupy 76% of the monetary value of the exports.

There are three kinds of processed products, frozen product, canned products, and fish meal. The frozen and canned products are all shipped for export, and 61% of the fish meal (29,238 tons) is shipped out.

Of the frozen products, shrimp and lobster constitute more than 90% in quantity, and rank top in monetary value as well. The export to Japan of these frozen products was overwhelmingly large, totaling 83% of the 4,229 tons. Main destinations of the frozen lobster were the U.S.A. and France, and the lobster exports to both these countries were 43%. Frozen fish destined for Kuwait accounted for 55% of the total products.

Only shrimp are canned presently, and they are mainly for export and scarcely are used domestically. Destined largely for the European Continent, two countries of France and U.K. accounted for 761 tons or 60% of the total.

Inedible or small fish are processed mainly into fish meal, with 151,000 tons of inedible fish processed into 29,238 tons of fish meal. Of this output of fish meal, 11,437 tons were used as feed for domestic poultry, and 17,801 tons for export. The main destination in 1978 was West Germany, and it accounted for 13,810 tons or 78% of the total exported fish meal.

Classification of fish export commodities is made into three items, fish, shellfish, and processed products, totaling 29,186 tons. The fish are classified into dry salted fish, frozen fish and chilled fish, totaling 4,649 tons, 468 tons, and 41 tons, respectively. These constitute 18% of the total export. The exported dry salted fish was a total of 4,649 tons, with 99% of the total exported to Sri Lanka. Traditionally, Sri Lanka is the major country of import of dry salted fish from Pakistan. Recently, Sri Lanka has been attempting to reduce their foreign imports, and to improve their self-sufficiency of food, so the export of fish from Pakistan is being reduced. The total chilled fish exported was 41 tons with 75%, or 31 tons exported to Kuwait. The export of shellfish was 5,802 tons, this amounting to 20% of the total exports. Frozen products were the largest, with shrimps and lobsters accounting for 4,310 tons. Dry shrimps, exported mainly to Kuwait and Hong Kong, totaled 232 tons. Lobster export was 81 tons, less than 1% of the total exports, but the price per unit is the highest of all exports; it was exported mainly to the U.S.A. and France.

Among the processed fish products, fish meal was the most common at 17,801 tons, or 61% of the total exports; in terms of the price, this was only 12% of the exports. 13,810 tons, or 78% of the total output of 17,801 tons, were exported to West Germany in 1978.

Export of the sharks' fins in 1978 was 200 tons, with its greater part exported to Singapore and Hong Kong.

5-3 Fishery on Baluchistan Coast and in Gwadar

5-3-1 Catches

The catches of each fishing port along the Baluchistan coast except Gwadar in the last three years has been leveling off, as shown in Table 5-3. The fish catch of Gwadar is increasing remarkably, registering a rise of about 1.2 from the previous year. Rich in variety, 32 kinds of

fish were caught in 1976 and 1977, as shown in Table 5-4. The greatest catch was sharks, whose fins were used for processed goods. The next highest catch was tuna, showing almost the same quantity of catch for the last two years.

5-3-2 Fish Catch Distribution

(1) Baluchistan coast

The commercial and industrial catches of fish are utilized in the following methods on the Baluchistan coast, including Gwadar, as shown in Table 5-5.

Fresh Marketed
Iced
Cured
Salted
Other processes

Taking catch in 1978, the quantity of dry salted fish was the greatest, accounting for 24% of the total products, or 65,096 tons. It was followed by salted fish, accounting for 22%, iced fish at 22%, fish meal at 21%, local consumption at 10%, and dry fish at 1%.

With respect to the weight of the processed products, the quantity of iced products was greatest, as shown in Table 5-6, accounting for 37% of the total products, or 37,423 tons. It was followed by salted fish with 19%, local consumption with 17%, dry salted fish with 14%, fish meal with 12%, and dry fish with 1%.

With respect to the destination of the processed products, 4,351 tons of dry salted fish, or 12% of all products, are exported to Sri Lanka directly. The other destinations of the products were Karachi, with 20,166 tons, or 54%, Turbat and inland consumption with 6,344 tons, or 17%, and the local consumption of the remaining 6,562 tons, or 17%.

The trends of the use of fish products for three years, from 1976 to 1978, indicate that the quantity of export to Sri Lanka is decreasing, while the demand of Karachi and inland showed an increase. The destinations of products by area seem to depend upon the distance from Karachi to each area, as shown Table 5-7 and Fig. 5-1.

(2) Gwadar

In 1978, the quantity of salted fish was the greatest, as shown in Table 5-8, accounting for 30% or 7,292 tons of the total products. It was followed by fish meal at 26%, dry salted fish at 23%, iced fish at 12%, local consumption accounting for 8%, and other processed goods at 1%.

With respect to weight of the processed products, the quantity of salted fish was greatest, accounting for 30%, or 3,646 tons of the total products (see Appended Table A 5-13). It was followed by iced products accounting for 21%, fish meal at 17%, local consumption at 16%, dry salted fish at 15%, and other processed goods at 1%.

With respect to the destination of the processed products, 1,463 tons of dry salted fish, or 12% of all products (79% of all dry salted fish), are exported to Sri Lanka directly. The other destinations of the products were Karachi, with 4,685 tons, or 39%, Turbat and inland

consumption on the outskirts with 4,031 tons, or 33%, and local consumption of the remaining 2,020 tons, or 16%. Demand in Karachi and the upcountry appears to be increasing.

5-3-3 Fishing Crafts in Gwadar

As shown in Appended Table A 5-14, there was a total of 807 fishing crafts, including 376 powered fishing crafts and 431 sail boats, in 1978, the percentage of powered boats standing at 47% in Gwadar. The dimensions of fishing crafts are listed in Appended Table A 5-15. Those indicated in the upper part are normal in Pakistan, whereas the lower part of the figure shows the dimensions of the typical fishing crafts measured in Gwadar.

It is conceivable that there will be a greater number of larger powered boats in the future, but for the present, there exist the following impeding factors:

(1) Lack of funds for motorization of fishing boats, and for the building of fishing boats larger in size
(2) Shortage of spare engine parts
(3) Shortage of petroleum and other fuel supplies for boats
(4) Lack of materials for ship building

5-3-4 Fishermen

There were 6,351 fishermen in Gwadar in 1978 (see Table 4-6). The crew per fishing boat was 7.9 persons, and the catch per fisherman was 3.8 tons.

The proceeds of a fish catch, in case of large scale vessels, were divided into 25% for the ship owner, 30% for the captain and 45% for the crew.

Fig. 5-1 Disposal of Fish and Fish Products on Baluchistan Coast by Area

(Unit: in dried weight tons)

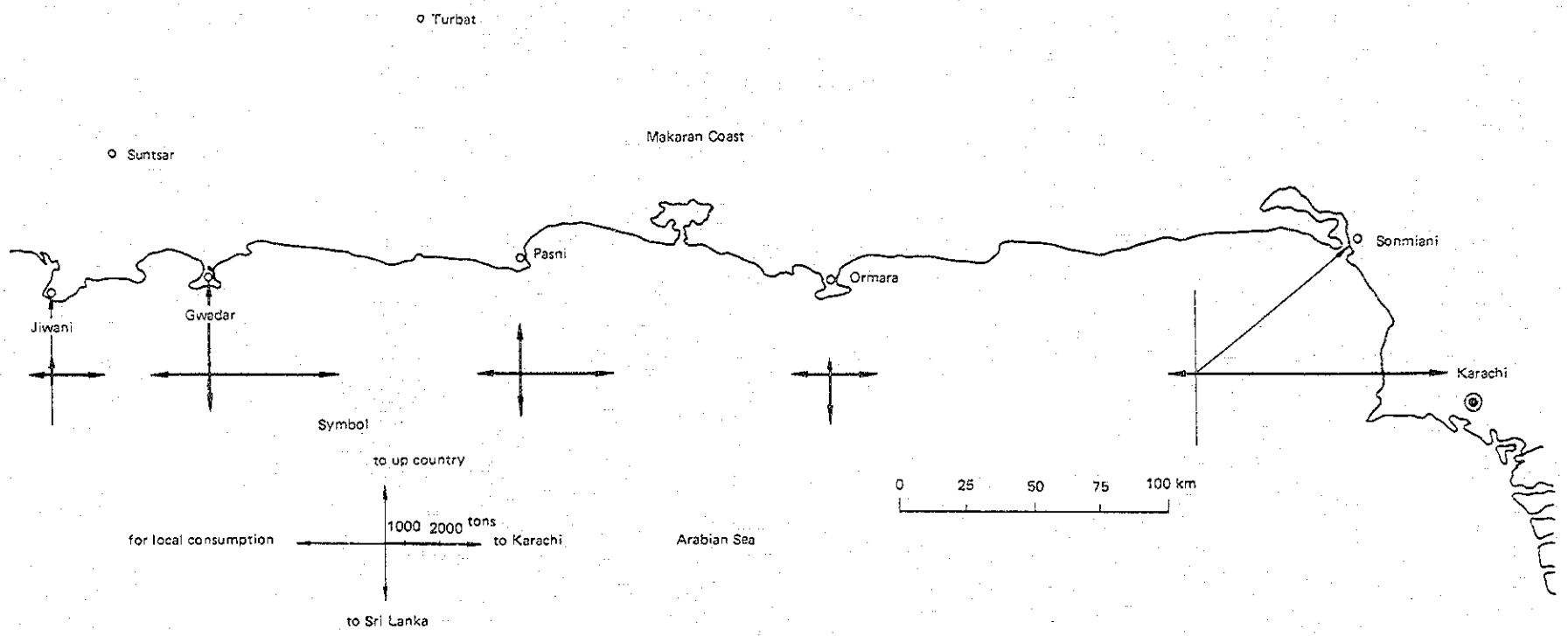


Table 5-1 Nominal Catch of Fish and Shrimps Commercial, Industrial and Subsistence Catch (1976 – 1978)

(Quantity in Metric Tons)

Area	Nominal Catch								
	Commercial and Industrial Catch			Subsistence Catch			Total		
	1976	1977	1978	1976	1977	1978	1976	1977	1978
Pakistan:	184,559	245,074	270,782	21,100	22,880	22,247	205,659	267,954	293,029
Marine:	163,368	219,516	243,656	13,800	15,300	14,150	177,168	234,816	257,806
i) Karachi and Sind Coasts	117,795	155,168	178,560	10,000	10,800	10,900	127,795	165,968	189,460
ii) Baluchistan Coast	45,573	64,348	65,096	3,800	4,500	3,250	49,373	68,848	68,346
Inland:	21,191	25,558	27,126	7,300	7,580	8,097	28,491	33,138	35,223

Source: "Hand Book of Fisheries Statistics of Pakistan 1977" and "1978"
Marine Fisheries Department, Government of Pakistan

Table 5-2 Comercial and Industrial Production of Fish and Shrimps (1976 – 1978)

Quantity in Metirc Tons

Area	Total			Fish			Shrimps		
	1976	1977	1978	1976	1977	1978	1976	1977	1978
Pakistan:	184,559	245,074	270,782	162,285	224,559	251,383	22,274	20,515	19,399
Marine:	163,368	219,516	243,656	141,094	199,001	224,257	22,274	20,515	19,399
i) Karachi and Sind Coasts	117,795	155,168	178,560	97,585	137,120	161,540	20,210	18,048	17,020
ii) Baluchistan Coast	45,573	64,348	65,096	43,509	61,881	62,717	2,064	2,467	2,379
Inland:	21,191	25,558	27,126	21,191	25,558	27,126	–	–	–

Source: "Hand Book of Fisheries Statistics of Pakistan 1977" and "1978"
Marine Fisheries Department, Government of Pakistan

Table 5-3 Marine Fish Products by Area (1976 – 1978)

(Quantity in Metric Tons)

Year	Jiwani	Gwadar	Pasni	Ormara	Sonmiani	Total
1976	(8.8%) 4,010	(30.9) 14,062	(21.9) 9,990	(17.0) 7,755	(21.4) 9,756	(100%) 45,573
1977	(8.7%) 5,599	(30.9) 19,898	(22.1) 14,221	(14.7) 9,425	(23.6) 15,205	(100%) 64,348
1978	(6.1) 3,958	(37.1) 24,125	(20.8) 13,551	(15.3) 9,962	(20.7) 13,500	(100%) 65,096

Note: ( ) denotes share of fish products by area

Source: Directorate of Fisheries, Government of Baluchistan

Table 5-4 Fish Products around Gwadar (1976 – 1977)

(In Metric Tons)

Name of Species	Fish Products	
	1976	1977
Sharks	1,930	2,758
Skates	74	89
Rays	1,328	1,078
Sardine	433	1,311
Hilsa	327	290
Silver bar Fish	456	372
Other clupeide	112	1,825
Cat Fish	531	990
Eels	27	25
Mullets	48	103
Threadfin Fish	67	32
Barracuda	326	287
Groupers	94	333
Rockcod	171	239
Butter Fish	219	97
Leather Jacket	1,050	1,576
Trevally	440	833

Name of Species	Fish Products	
	1976	1977
Jumper	221	38
Dolphin Fish	62	53
Snapper	300	713
Grunter	318	280
Seabrean	226	57
Jew Fish	715	1,138
Croakers	312	590
King Mackeral	582	844
Mackeral	365	276
Tuna	1,948	1,949
Bill Fish	185	332
Pomfrets	586	603
Flat Fish	55	71
Prawn	526	489
Lobster	28	227
Total	14,062	19,898

Source: Directorate of Fisheries; Government of Baluchistan

Table 5-5 Disposal of Fish and Fish Products on Baluchistan Coast (1976 – 1978)

(Unit: in fresh weight tons)

Commodity	Year	Local Consumption	Exported to Sri Lanka	Sent to Karachi	Sent to Turbat & other upcountry	Total
		%	%	%	%	%
Fresh fish	1976	5,352 (11.7)				5,352 (11.7)
	1977	6,086 (9.5)				6,086 (9.5)
	1978	6,562 (10.1)				6,562 (10.1)
Iced fish	1976			2,300 (5.0)	219 (0.5)	2,519 (5.5)
	1977			7,882 (12.2)	369 (0.6)	8,251 (12.8)
	1978			11,838 (18.2)	385 (0.6)	12,223 (18.8)
Wet salted fish	1976			3,974 (8.7)	2,001 (4.4)	5,975 (13.1)
	1977			4,517 (7.0)	10,701 (16.7)	15,218 (23.7)
	1978			3,602 (5.6)	10,880 (16.7)	14,482 (22.3)
Dry salted fish	1976		15,683 (34.4)	3,012 (6.6)	3,123 (6.9)	21,818 (47.9)
	1977		19,917 (31.0)	1,243 (1.9)	621 (1.0)	21,781 (33.9)
	1978		13,052 (20.1)	813 (1.2)	1,485 (2.3)	15,350 (23.6)
Fish maws & shark fins	1976			225 (0.5)		225 (0.5)
	1977			924 (1.4)		924 (1.4)
	1978			603 (0.9)		603 (0.9)
Fish meal	1976			7,653 (16.8)		7,653 (16.8)
	1977			9,678 (15.0)		9,678 (15.0)
	1978			13,571 (20.8)		13,571 (20.8)
Iced Prawn	1976			1,391 (3.1)		1,391 (3.1)
	1977			1,472 (2.3)		1,472 (2.3)
	1978			1,521 (2.3)		1,521 (2.3)
Dried prawn	1976			450 (1.0)	49 (0.1)	499 (1.1)
	1977			474 (0.7)	67 (0.1)	541 (0.8)
	1978			246 (0.4)	72 (0.1)	318 (0.5)
Iced lobster	1976			141 (0.3)		141 (0.3)
	1977			398 (0.6)		398 (0.6)
	1978			466 (0.7)		466 (0.7)
Total	1976	5,352 (11.7)	15,683 (34.4)	19,146 (42.0)	5,392 (11.9)	45,573 (100)
	1977	6,086 (9.5)	19,917 (31.0)	26,587 (41.1)	11,758 (18.4)	64,348 (100)
	1978	6,562 (10.1)	13,052 (20.1)	32,660 (50.1)	12,822 (19.7)	65,096 (100)

Source: Directorate of Fisheries, Government of Baluchistan

Table 5-6 Disposal of Fish and Fish Products on Baluchistan Coast (1976 – 1978)

(Unit: in dried weight tons)

Commodity	Year	Local Consumption	Exported to Sri Lanka	Sent to Karachi	Sent to Turbat & other upcountry	Total
		%	%	%	%	%
Fresh fish	1976	5,352 (24.5)				5,352 (24.5)
	1977	6,086 (17.8)				6,086 (17.8)
	1978	6,562 (17.5)				6,562 (17.5)
Iced fish	1976			2,300 (10.5)	219 (1.0)	2,519 (11.5)
	1977			7,882 (23.0)	369 (1.1)	8,251 (24.1)
	1978			11,838 (31.6)	385 (1.1)	12,223 (32.7)
Wet salted fish	1976			1,987 (9.1)	1,001 (4.6)	2,988 (13.7)
	1977			2,258 (6.6)	5,351 (15.6)	7,609 (22.2)
	1978			1,801 (4.8)	5,440 (14.5)	7,241 (19.3)
Dry salted fish	1976		5,228 (24.0)	1,003 (4.6)	1,041 (4.7)	7,272 (33.3)
	1977		6,639 (19.4)	414 (1.2)	207 (0.6)	7,260 (21.2)
	1978		4,351 (11.6)	271 (0.8)	495 (1.3)	5,117 (13.7)
Fish maws & Shark fins	1976			78 (0.4)		78 (0.4)
	1977			308 (0.9)		308 (0.9)
	1978			201 (0.5)		201 (0.5)
Fish meal	1976			2,551 (11.7)		2,551 (11.7)
	1977			3,226 (9.5)		3,226 (9.5)
	1978			4,523 (12.1)		4,523 (12.1)
Iced prawn	1976			825 (3.8)		825 (3.8)
	1977			1,104 (3.2)		1,104 (3.2)
	1978			1,217 (3.3)		1,217 (3.3)
Dried prawn	1976			150 (0.7)	16 (0.1)	166 (0.8)
	1977			158 (0.4)	22 (0.1)	180 (0.5)
	1978			82 (0.2)	24 (0.1)	106 (0.3)
Iced lobster	1976			71 (0.3)		71 (0.3)
	1977			199 (0.6)		199 (0.6)
	1978			233 (0.6)		233 (0.6)
Total	1976	5,352 (24.5)	5,228 (24.0)	8,965 (41.1)	2,277 (10.4)	21,822 (100)
	1977	6,086 (17.8)	6,639 (19.4)	15,549 (45.4)	5,949 (17.4)	34,223 (100)
	1978	6,562 (17.5)	4,351 (11.6)	20,166 (53.9)	6,344 (17.0)	37,423 (100)

Source: Department of Fisheries, Government of Baluchistan

Table 5-7 Disposal of Fish and Fish Products on Baluchistan Coast by Area in 1978

(Unit: in dried weight tons)

	Jiwani	Gwadar	Pasni	Ormara	Sonmiani	Total
Local Consumption	623 (9.5%)	2,020 (30.8%)	1,605 (24.5%)	1,434 (21.8%)	880 (13.4%)	6,562 (100%)
Export to Sri Lanka	–	1,463 (33.6%)	1,291 (29.7%)	1,597 (36.7%)	–	4,351 (100%)
Sent to Karachi	1,729 (8.6%)	4,685 (23.2%)	3,157 (15.6%)	1,406 (7.0%)	9,189 (45.6%)	20,166 (100%)
Sent to Turbat & other up country	336 (5.3%)	4,031 (63.6%)	1,636 (25.8%)	341 (5.3%)	–	6,344 (100%)
Total	2,688 (7.2%)	12,199 (32.6%)	7,689 (20.5%)	4,778 (12.8%)	10,069 (26.9%)	37,423 (100%)

Source: Department of Fisheries, Government of Baluchistan

Table 5-8 Disposal of Fish and Fish Products in Gwadar (1977 – 1978)

(Unit: in fresh weight tons)

Commodity	Year	Local Consumption	Exported to Sri Lanka	Sent to Karachi	Sent to Turbat & other upcountry	Total
		%	%	%	%	%
Fresh fish	1977	1,970 (9.9)				1,970 (9.9)
	1978	2,020 (8.4)				2,020 (8.4)
Iced fish	1977			–	11 (0.1)	11 (0.1)
	1978			1,861 (7.7)	115 (0.5)	1,976 (8.2)
Wet salted fish	1977			678 (3.4)	7,308 (36.7)	7,986 (40.1)
	1978			–	7,292 (30.2)	7,292 (30.2)
Dry salted fish	1977		4,942 (24.8)	376 (1.8)	437 (2.2)	5,755 (28.8)
	1978		4,390 (18.2)	390 (1.6)	810 (3.4)	5,590 (23.2)
Fish maws & Shark fins	1977			210 (1.1)		210 (1.1)
	1978			150 (0.6)		150 (0.6)
Fish meal	1977			3,273 (16.5)		3,273 (16.5)
	1978			6,321 (26.2)		6,321 (26.2)
Iced prawn	1977			261 (1.3)		261 (1.3)
	1978			500 (2.1)		500 (2.1)
Dried prawn	1977			174 (0.9)	32 (0.2)	206 (1.1)
	1978			6 (–)	–	6 (–)
Iced lobster	1977			226 (1.1)		226 (1.1)
	1978			270 (1.1)		270 (1.1)
Total	1977	1,970 (9.9)	4,942 (24.8)	5,198 (26.1)	7,788 (39.2)	19,898 (100)
	1978	2,020 (8.4)	4,390 (18.2)	9,498 (39.3)	8,217 (34.1)	24,125 (100)

Source: Directorate of Fisheries, Government of Baluchistan

Table 5-9 Disposal of Fish and Fish Products in Gwadar (1977 – 1978)

(Unit: in dried weight tons)

Commodity	Year	Local Consumption	Exported to Sri Lanka	Sent to Karachi	Sent to Turbat & other upcountry	Total
		%	%	%	%	%
Fresh fish	1977	1,970 (20.9)				1,970 (20.9)
	1978	2,020 (16.5)				2,020 (16.5)
Iced fish	1977			–	11 (0.1)	11 (0.1)
	1978			1,861 (15.3)	115 (0.9)	1,976 (16.2)
Wet salted fish	1977			339 (3.6)	3,654 (38.7)	3,993 (42.3)
	1978			–	3,646 (29.9)	3,646 (29.9)
Dry salted fish	1977		1,647 (17.5)	125 (1.3)	146 (1.6)	1,918 (20.4)
	1978		1,463 (12.0)	130 (1.1)	270 (2.2)	1,863 (15.3)
Fish maws & Shark fins	1977			70 (0.7)		70 (0.7)
	1978			50 (0.4)		50 (0.4)
Fish meal	1977			1,092 (11.6)		1,092 (11.6)
	1978			2,107 (17.3)		2,107 (17.3)
Iced prawn	1977			196 (2.1)		196 (2.1)
	1978			400 (3.3)		400 (3.3)
Dried prawn	1977			58 (0.6)	11 (0.1)	69 (0.7)
	1978			2 (–)	–	2 (–)
Iced lobster	1977			112 (1.2)		112 (1.2)
	1978			135 (1.1)		135 (1.1)
Total	1977	1,970 (20.9)	1,647 (17.5)	1,992 (21.1)	3,822 (40.5)	9,431 (100)
	1978	2,020 (16.5)	1,463 (12.0)	4,685 (38.5)	4,031 (33.0)	12,199 (100)

Source: Directorate of Fisheries, Government of Baluchistan

Chapter 6
Natural Environment

Chapter 6 Natural Environment

6-1 General

This area belongs to the monsoon zone, with alternating NE and SW monsoons. It is also subject to the influence of cyclones moving west or north in the Indian Ocean and the Arabian Sea. Consequently, considerable waves can be produced at sea and surge toward the seashore.

The Headland, running east to west for about 13 km on the south side of Gwadar, is composed of relatively soft rocks and is, therefore, subject to weathering and erosion by the action of the external forces of rain, wind, wave, tide, and current, and the sea bottom in its vicinity consists of fine sand or silt deposited thereon. In a stormy weather, littoral drift is active on account of wave erosion at the Headland, and movement of the submarine sand. Thus, with the construction of port facilities, or dredging of the channel, the condition of littoral drift or siltation may change drastically. There will be then a possibility of needing to protect the adjacent seashore against erosion, or to engage in maintenance dredging.

With reference to the results of the surveys heretofore conducted, the natural conditions in the vicinity of the Mini-Port site are described in sections 6-2 to 6-6. In Chapter 7 is reported the result of the field surveys of natural conditions conducted by the Japanese Study Team.

6-2 Topography

6-2-1 Land Configuration

The topography of the Gwadar area is characterized by three parts, the Headland, the mainland, and the connecting sand spit.

The Headland stretches east to west for about 13 km, with a width of about 3 km to the west and about 1.3km to the east. It descends from north to south in a gentle slope, the highest point being about 150m. The coastline is a steep cliff, and precludes landing from the sea. Makran Coast, the mainland, is desert zone where few plants grow. To the northeast of Gwadar City is situated Koh-e-Medi, which is similar to the Headland. The geology is a river antecedent (not following the undulations but creating a valley and cross-cutting a cape). The sand spit where the city of Gwadar is situated is narrowest at about 800 m in the vicinity of the Headland and is a lowland stretching in the form of a funnel. It has an altitude of about 8 m at its highest place.

The site of the planned Mini-Port is about 1 km north of the south end of the sand spit. This is on the south edge of the urban district of Gwadar. It is a flat sandy land, used for drying fish at present. There are few houses or trees at the site. The western part of the site is adjacent to a village and graveyard, and there is enough space for installing land facilities.

6-2-2 Submarine Topography

The available chart near Gwadar is "Approaches to Gwadar, PAK-II" prepared by the Pakistan Navy in 1962 on the basis of a 1959 survey. "NESPAK Report" contains a chart of the southern part of the East Bay from the survey results obtained by the Pakistan Navy in 1972.

In addition, in September of 1979 the Japanese Study Team carried out a detailed sounding survey over a 33 km^2 area (6 km x 5.5 km) in the southern part of the East Bay. The team made a sounding chart on the basis of 200 m mesh and locally 100 m mesh sounding results. The chart shows that the sea bottom in the southern part of the East Bay has an almost uniform gentle slope; the slope being 1/50 – 1/100 near shore, and 1/500 – 1/1000 offshore. In the vicinity of the Mini-Port site, a water depth of 2 m exists 1.5 km from the Setting Out Point (SOP) and 3 m at 2 km. The team assumed that the height of the Bench Mark obtained by tidal level observation is DL + 3.422 m.

6-2-3 Beach Erosion

In the Gwadar East Bay, the shore is eroded in some places, forming an erosion cliff in front of the shore and a dune in the back. At present, buildings around the Customhouse have been damaged, with the foundation scoured. Waves produced by easterly winds are considered to be the main cause of erosion, with the ordinary low swells not likely to cause erosion. Comparing the chart prepared in 1972 with that of 1874, erosion is occurring near the town and in the back of Ras Nuh, and deposition is ocurring in the southwestern part. The littoral drift originates from sand beaches, cliffs, dunes, rain erosion, sea bottom scours, and rivers. The sand gradually moves to the north, the speed of erosion estimated to be 1 m to 2 m a year.

Dunes move from west to east, and the sand eroded out of the West Bay or the Headland deposits in the East Bay. Not seen on the sea bottom is the mica transported along the Indus River, but at a water depth of 11 to 15 m or greater is deposited the gray mud of crushed mudstone. In the NE monsoon season, there is little sand drifting westward.

6-3 Geology

The Headland is composed entirely of sedimentary rocks, its composition complex. The Headland is mainly comprised of weakly consolidated mudstone, called an Ormara Formation, formed in Pliocene to Pleistocene age. This layer is partially covered by a layer of hard limestone called a Jiwani Formation, of the Pleistocene age, and has durability against erosion. The lower mudstone is eroded readily by rain or waves.

The sand spit is formed, for the greater part, by fine sand containing a large quantity of very fine shell fragments. Weathered sandstone exists in some places, and is particularly visible on the east coast about 2 km north of the town. At this site, the sand dunes are well developed.

The mainland is composed of the Makran Coast Range, consisting of mudstone formed before the Headland in the Miocene to Pliocene ages, Koh-e-Medi and Koh-e-Sur containing occasional outcrops of the Jiwani formation and Ormara formation, and sand dunes. This area is considered to be formed under the influences of dislocation and folding due to the complex crustal movements occurring in the same period as the Himalayan orogenic movements.

6-4 Meteorology

6-4-1 Rain

The annual average precipitation is low at about 150 mm, with the NE monsoon season of December to February accounting for about two thirds of the rainfall. The rainfall is not regular, and dry weather is apt to continue for 2 to 3 years. In February to August, a sand or dust storm can be produced near the coast. The rivers have the water flow only immediately after a rainfall, with exposed cliffs and muddy banks eroded greatly by precipitation.

6-4-2 Wind

Although windstorms are not frequent, they are regular. The climate is divided into two seasons: SW monsoon season of mid-May to mid-September and NE monsoon season of December to February. In the other months, emergence of winds is not regular but are affected by the rise and fall of the monsoon lows.

Dec. – Mar.:	Surface wind is weak; In the morning, N – NE land wind; In the afternoon, SW sea breeze (wind velocity, 4 – 6m/sec); At 1000m above the ground, W – NW (velocity, 6m/sec).
Apr. – Jun.:	SW – W (velocity, 6m/sec).
Jul. – Sep.:	In the morning, E – SE; In the afternoon, SW.
Oct. – Nov.:	Land and sea winds; Sea winds at a velocity of 4 – 5m/sec.

In the northern Arabian Sea, the wind conditions differ from the east to the west. According to the reports of 4,000 ships, the wind direction is WSW in the east and SW in the west with both having a wind speed of about 14 m/sec maximum. Strong winds occur from June to September (2% of the time).

In summer, the low moves inland, and the wind direction becomes SW. In winter, the low moves onto the Arabian Sea, and the wind drops. This can be expressed as follows.

Nov. – Mar.:	Low wind velocity; Sea wind 4 – 6m/sec (in the afternoon).
Apr. – Jun.:	SW to W, 6 – 8m/sec.
Jul. – Oct.:	SW 8 – 10m/sec (in the afternoon).

Dust storms occur several times a year. Cyclonic storms are rare along the coast, occurring only once or twice during the period of 70 years from 1891 to 1960. From January to March, the weather is calm.

The tracks of cyclones coming from the Arabian Sea, and storms occurring in the Bay of Bengal, either make a sharp turn toward the Gulf of Kutch, or proceed over the Arabian Sea from east to west, and diminish in the Arabian Peninsula. This brings some storm surge to the Gwadar seashore.

6-5 Sea Conditions

6-5-1 Tides

The tides at Gwadar have been determined by the Japanese Study Team to be the following. They are generally diurnal, and have a great inequality in height.

MHWL	+2.29m
MLHW	+1.73m
MHLW	+0.83m
MLLW	+0.27m

These tide levels have little relation with those at Karachi. Due to the entrance of the Persian Gulf, the time of the tides is delayed from that at Karachi.

At the spring tide of the summer (winter) solstice, the phases of diurnal and semidiurnal tides coincide, resulting in a great tide range.

A storm tide of about 80 cm was recorded at Karachi in 1902. A seiche with wave height of about 5 cm and with a period of 2.5 minutes was observed at Karachi. There is recorded a storm surge of about 45 cm at Karachi, when a cyclone moved over the Arabian Sea about 500 – 700 km away.

6-5-2 Currents

The ocean current flows with the earth's rotation, running east in the Arabian Sea .The tidal current runs east with the flood tide, and west with the ebb tide, and is of a speed less than 0.5 kt in the spring. In the SW monsoon season, the current direction is identical with the wind direction, and the speed is close to 1 kt. The eastbound current prevails (with an emergence rate of 1/3), except in November and January when the current flows west. Near Ras Nuh, an eastbound current of 4 kt was observed.

6-5-3 Waves

Depressions traversing the coast in June produce a wind of 15 – 18 m/sec, which generates swells and wave surges. The maximum significant wave height so far estimated is 4.5m.

In the SW monsoon season, high swells come from the far south, in the Arabian Sea. The wave height is 3 – 4.5 m at Karachi, but less than 3 m in the western part, with the wave direction SW – S. Wind waves due to climatic disturbances are produced in summer, with a wave height as great as 4.5 – 6 m in the offing. Climatic disturbances may occur in winter, but their emergence is rare. However, winds of a speed of about 15 m/s and a duration of about 24 hours may occur in the S – W direction, so that the generated waves grow as high as 6 m.

Shallow water waves are in the direction of SSW – SSE, and swells from deepwater waves of a height of 2.5 – 3.5 m and a period of 11 – 13 seconds enter into the Gwadar Bay with transformation. In the Bay, steep waves with a height of about 1 m and a period of about 5 seconds have been observed (in July). Waves due to an easterly wind are less than the above, and in front of the town, the waves are less than 1.5 m. (In the case of a wave direction of SSE, the

wave height is 2.5 m; the wave breaking depth, 3 – 3.6 m; distance of wave breaking from the shore, 150 – 900 m, but varies depending on the tidal level).

From the isobars and wind directions, swells will be WSW in the east coast and SSW in the west coast. Westerly swells coming from the Gulf of Oman are lower than those from the Arabian Sea. Swells produced when a storm moves over the Arabian Sea about 600 – 700 km away are also equally low.

The SW monsoons are of sufficiently great size and duration so that they are matured when they reach Gwadar. Thus, the wind velocity is estimated at 13 – 14 m/sec; the period at 4.4 – 15.5 seconds (average period at 10 seconds); mean wave height H = 3.2m; and significant wave height ($H_{1/3}$) equals to about 4 m.

From wavegauge observations conducted at Karachi, the following spectra were obtained:

Period	T = 6.5 – 8.5 sec	(Emergence 16.5%)
	T = 8.5 – 10.5 sec	(Emergence 26.5%)
	T = 10.5 – 12.5 sec	(Emergence 19.8%)
	T = 12.5 – 14.5 sec	(Emergence 4.2%)

The SW monsoon occurs on the east coast of Africa. It develops as it moves over the Arabian Sea and is at its height at the west coast of the Indian Ocean. The swells show the following emergence rates:

Wave height	H = below 0.9 m	(Emergence 85–90%)
	H = 0.9 – 3 m	(Emergence 10–15%)
	H = above 3 m	(Emergence, rare)

Emergence of swells is shown in Table 6-1 and Fig. 6-1.

6-5-4 Water Quality

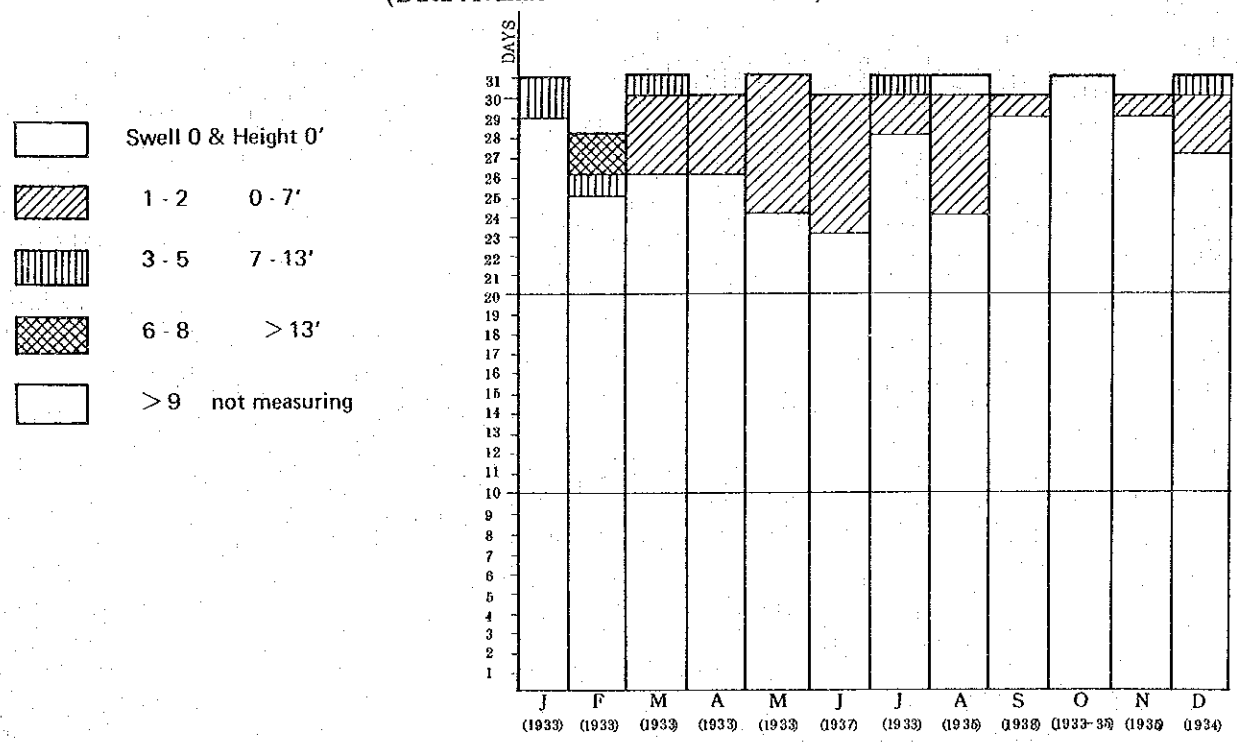
Water temperature is highest at 29°C in May (immediately before the SW monsoon season). In mid-summer, it declines to 27°C, on account of upwelling water. In October, it is 26 – 27°C owing to damping of the SW monsoon and fall of the atmospheric temperature. In February, it is lowest at 22°C. The salt content is 35.5‰ or higher in summer and 37‰ in winter, on account of the intensive solar radiation. The specific gravity is 1.025 – 1.029.

Table 6-1 Percentage Frequency of Swell Exceeding 8′, 4′, & 1′ for Different Directions

Direction	North Western Arabian Sea Frequency of Swell Exceeding > 1 ft. (%)	> 4 ft. (%)	> 8 ft. (%)	North Eastern Arabian Sea Frequency of Swell Exceeding > 1 ft. (%)	> 4 ft. (%)	> 8 ft. (%)
N	3.92	2.03	–	2.66	1.88	–
NE	5.66	1.25	–	2.58	0.38	–
E	6.75	3.92	–	3.33	–	–
SE	4.50	2.50	–	–	–	–
S	9.67	5.92	0.67	3.83	1.17	–
SW	34.40	25.20	9.92	33.60	25.90	12.25
W	6.75	1.83	–	15.40	5.50	1.50
NW	5.00	1.25	–	10.84	0.83	–

The Meteorological Atlas (1949) of the Royal Navy Hydrographic Office based upon 23 years of records.

Fig. 6-1 Swell at Gwadar
(Data Available from 1933 till 1938)



6-6 Earthquakes

6-6-1 Characteristics of Earthquakes in South West Asia

(1) Earthquake Zone

Earthquakes occur relatively frequently in this district, but no great earthquake zone, such as the Pacific "Ring of Fire" or the Atlantic earthquake belts, is found.

Gwadar is located at the west end of an earthquake zone which passes through Hindu Kush-Kashmir-Himalay-Assam as well as Rangoon–Sumatra–Java and meets the Pacific earthquake belt near New Guinea.

There is another earthquake zone which runs from the southern part of Iran (north of Hormuz Straits) in the northwest direction to the eastern part of Turkey.

(2) Frequent Earthquake Districts

Swarm earthquakes of deep focus occur frequently near 36°N 71°E in the Hindu Kush District of the northeast part of Afghanistan. Twelve such earthquakes were recorded during the 78 years between 1900 and 1977: one earthquake of M8.0 (M: Magnitude), six of $7.5 \leqq M < 8.0$ and five of $7.0 \leqq M < 7.5$. The depth of the focus was always around 200 km.

Earthquakes of $M \geqq 7.0$ occur frequently also in Tadzhik, Kirgiz and the east part of Uzbek in the USSR. Ten such earthquakes were recorded during the last 78 years. The largest one was M8.0 (1907), with a shallow focus.

Five earthquakes of $M>7$ have occurred during the last 78 years near Quetta City, in the west part of Pakistan. The largest one was M7.5 (1935), the focus was shallow.

(3) Damages by Earthquakes

Heavy damages and casualties have been recorded by following earthquakes.

1907 (M8.0)	Afghanistan-USSR border: 15,000 houses destroyed
1929 (M7.1)	Iran-USSR border: 3,253 fatalities
1935 (M7.5)	Quetta Earthquake: many casualties
1957 (M7.1)	Iran: 2000 fatalities
1957 (M7.2)	Western Iran: 1392 fatalities
1962 (M7 1/4)	Western Iran: more than 10,000 fatalities and many injured
1968 (M7-7 1/4)	Iran: more than 11,000 fatalities and 6,000 injured
1968 (M7.0)	Iran, more than 2,000 fatalities
1972 (M7)	Southern Iran: 5,374 fatalities and 1,710 injured

Earthquakes causing heavy casualties occur frequently in Iran. However, the damages seem relatively small in Pakistan, excluding the Quetta Earthquake in 1935.

(4) Large Earthquakes

Four earthquakes of $M \geqq 8.0$ and twelve earthquakes of $7.5 \leqq M < 8.0$ were recorded during the period of 1900–1977 in Southwest Asia.

The four earthquakes ($M \geqq 8.0$) are as described below.

1905	(M8.6)	Eastern Kashmir
1907	(M8.0)	Afghanistan – USSR border
1909	(M8.0)	Afghanistan – USSR border (Hindu Kush)
1945	(M8-1/4)	Near coast of West Pakistan

The focuses were shallow, except 1909 (M8.0).

Reference Materials: "Chronological Table of Science" 1975, 1978, 1979 edited by Tokyo Astronomical Observatory.

6-6-2 Earthquakes in Pakistan

(1) Classification of Regions by Earthquake Frequency

Frequent Earthquake Regions – Kashmir, northwest part of Baluchistan (near Quetta)

Relatively Frequent Earthquake Regions – Northwest border, northern part of Punjab, near Karachi, province of Baluchistan excluding the area near Quetta

Infrequent Earthquake Regions – East side of River Indus in the provinces of Punjab and Sind

(2) Earthquakes at Makran Coast

Earthquakes do not occur frequently in this region. However, an earthquake of M8.3 and an earthquake of M7.3 occurred in November of 1945 and in August of 1947, respectively. Additionally, several earthquakes smaller than M6.0 have been recorded.

The earthquakes of M8.3 (1934) and M7.8 (1933) which are recorded offshore of Hingol in the Arabian Sea cannot be confirmed by this study.

It may be concluded that there is a probability of an earthquake of $M \geqq 7.9$ once in every 100 years within 100 km from Gwadar and once or twice in every 100 years within 200 km.

Reference Material: "Gwadar Fish Harbour Preliminary Planning Report" August 1977 NESPAK

(3) Design Seismic Coefficient

According to the Seismic Zones of Pakistan, Gwadar District belongs to Zone II and the seismic intensity is g/10–g/15. The seismic intensity of Pansi District, which is adjacent to Gwadar, is given as g/5–g/10. It seams that the earthquake of 1945 was considered for this decision. It will be reasonable to apply the horizontal seismic coefficient of 0.1 to Gwadar in view of the rarity of large earthquakes.

Table 6-2 Big Earthquakes in South-West Asia

Year	Month	Day	Magnitude	N	E	Region	Year	Month	Day	Magnitude	N	E	Region
1905	4	4	8.6	33	76	A	1935	4	11	?	36.3	53.5	F
	9	26	7.1	29	74			5	30	7.5	29.5	66¾	C
1906	10	24	7.1	40	68	B	1937	11	14	7.2	36½	70½	A
1907	4	13	7.0	36.5	70.5	A	1943	2	28	7.0	36½	70½	A
	10	21	8.0	38	69	B	1944	9	27	7.0	39	73½	B
1909	1	23	7.7	33	50	F	1945	11	27	8¼	24½	63	C
	7	7	7¾	36.5	70.5	A	1946	11	2	7.6	41½	72½	B
	7	7	8.0	36.5	70.5	A	1946	11	4	7.5	39¾	54½	D
	10	20	7.0	29	68	C	1947	8	5	7.3	25½	63	C
1911	1	1	7.2	38	67	B	1948	10	5	7.3	37.5	58	D
	2	8	7.¾	40	73	B	1949	3	4	7.5	36	70½	A
	7	4	7.6	36	70.5	A		7	10	7.6	39	70½	B
1914	2	6	7.0	29.5	65	C	1954	3	31	7¼	12.5	58	
1921	11	15	7¾	36.5	70.5	A	1955	4	15	7.0	40	75	B
1922	12	6	7.5	36.5	70.5	A	1956	6	9	7.6	35	67.5	A
1923	9	17	?	35.5	55	F	1957	7	2	7.1	36	53	F
1926	9	2	7.0	33.5	59	E		12	13	7.2	34.5	48	F
	10	22	?	40.5	45		1962	9	1	7¼	35.6	50	F
1928	8	21	?	35.5	59	E	1965	3	14	7½–¾	36.3	70.7	A
1929	2	1	7.1	36.5	70.5	A	1967	11	23	6¾–7	14.5	52.1	
	5	1	7.1	38	58	D	1968	8	31	7–7¼	34	59	E
1930	9	22	?	38.8	70	B		9	1	7.0	34	58.2	E
1931	4	27	?	38.7	46.1		1972	4	10	7	28.4	52.8	G
	8	24	7.0	30¼	67¾	C	1974	7	30	7.4	36.4	70.8	A
	8	27	7.4	29¾	67¼	C		8	11	7.3	39.5	73.8	B
1934	6	13	7.0	27.5	62.5	C	1976	4	8	7.1	40.3	63.8	D
								5	17	7.1	40.4	63.5	D
							1977	3	21	7.0	27.6	56.4	G

Region
- A Hindu Kush (Afghanistan)
- B Eastern Uzbek, Tadzhik, Kirgiz (USSR)
- C Western Pakistan
- D Turkmen, Uzbek (USSR)
- E Eastern Iran
- F Western Iran
- G Southern Iran

Fig. 6-2 Epicenters of Big Earthquakes in South-West Asia
(since 1900)

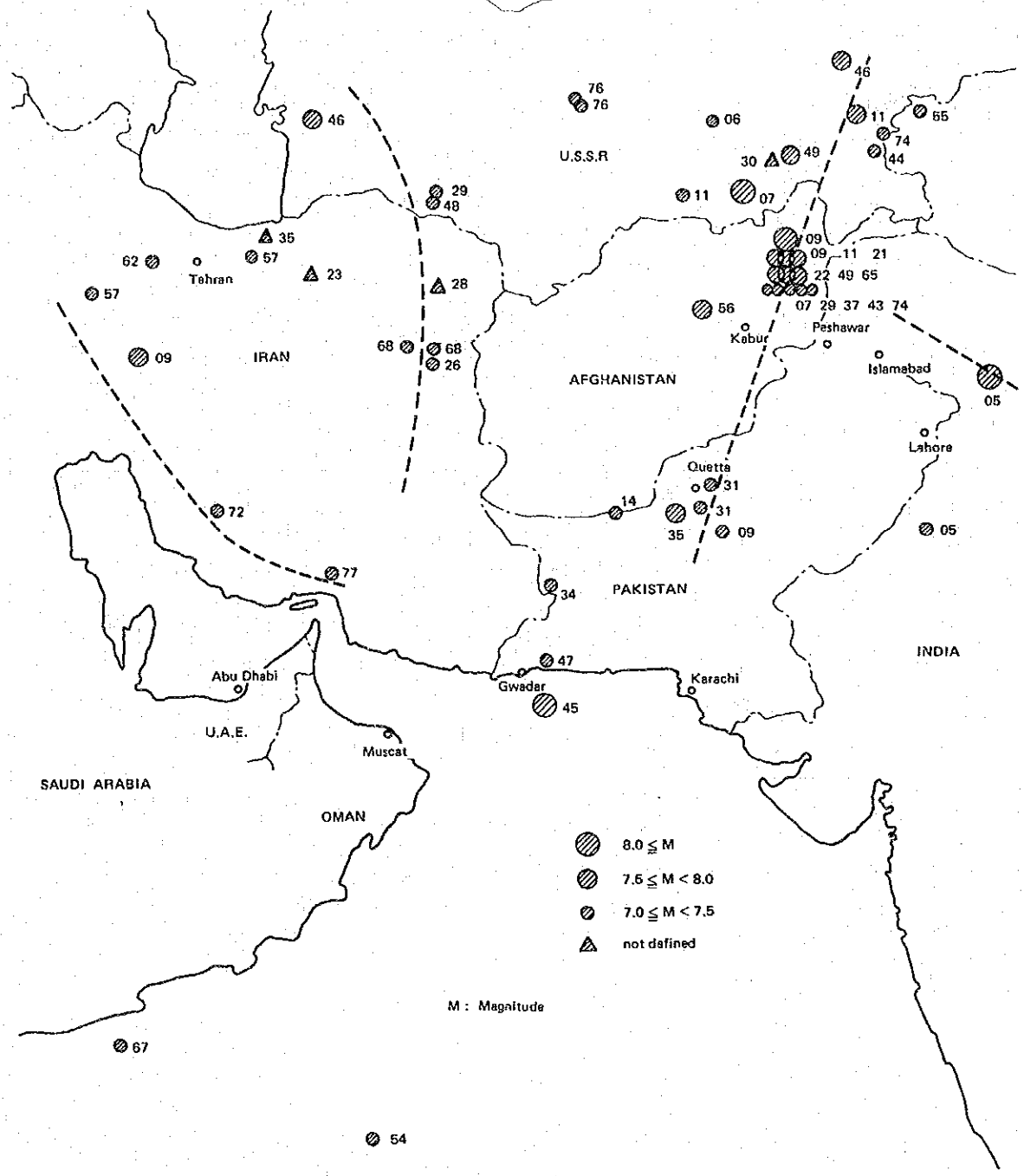


Fig. 6-3 Major Seismic Activity on Makran Coast
(1905 – 1970)

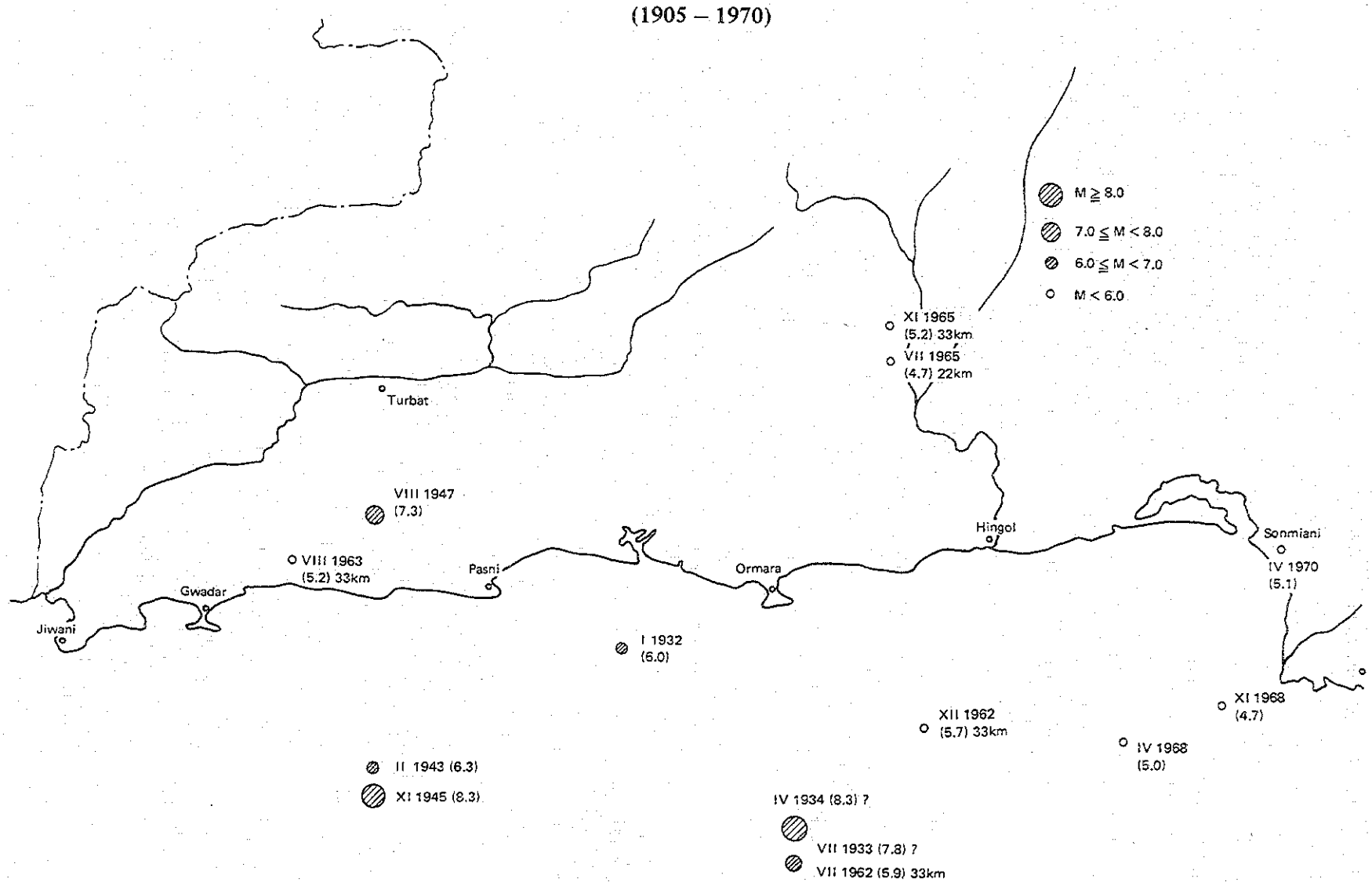


Fig. 6-4 Seismic Zones of Pakistan