JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF WORKS, TRANSPORT AND COMMUNICATIONS
REPUBLIC OF BOTSWANA

MINISTRY OF WORKS AND SUPPLY
REPUBLIC OF ZAMBIA

THE FEASIBILITY STUDY ON THE PROPOSED KAZUNGULA BRIDGE OVER THE ZAMBEZI RIVER BETWEEN THE REPUBLIC OF BOTSWANA AND THE REPUBLIC OF ZAMBIA

FINAL REPORT SUMMARY

MARCH 2001

NIPPON KOEI CO., LTD
ORIENTAL CONSULTANTS CO., LTD.

The following foreign exchange rate is applied in the study:

(As of November 2000)

1 US$	=	3600.0	Kwacha (Zambia)
1 US$	=	5.5	Pula (Botswana)
1 US$	=	55.0	Z$ (Zimbabwe)
1 US$	=	110.0	Yen (Japan)

PREFACE

In response to a request from the Government of Republic of Botswana and the Government of Republic of Zambia, the Government of Japan decided to conduct a feasibility study on the Kazungla Bridge over the Zambezi River and entrusted the study to the Japan International Cooperation Agency (JICA).

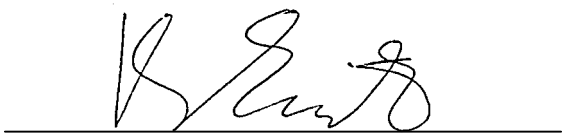
JICA selected and dispatched a study team headed by Mr. Koji Enomoto of Nippon Koei Co., Ltd. and consists of Nippon Koei Co., Ltd. and Oriental Consultants Co., Ltd. to Botswana and Zambia two times between August 2000 and March 2001. In addition, JICA set up an advisory committee headed by Atsushi Nitta, Director of Long-span Bridge Engineering Center, Honshu-Shikoku Bridge Authority between August 2000 and March 2001, which examined the study from specialist and technical point of view.

The team held discussions with the officials concerned of the Governments of Republic of Botswana and Republic of Zambia and conducted field surveys at the study area. Upon returning of Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship among our three countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Governments of Republic of Botswana and Republic of Zambia for their close cooperation extended to the team.

March 2001



Kunihiko Saito
President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

We are pleased to submit to you the Feasibility Study Report on the Kazungula Bridge over the Zambezi River between the Republic of Botswana and the Republic of Zambia.

This study was conducted by Nippon Koei Co., Ltd., and Oriental Consultants Co., Ltd. under a contract with Japan International Cooperation Agency (JICA), during the period from August, 2000 to March, 2001. The report contains the advice and suggestions of the authorities concerned of the Government of Japan and your agency as well as the comments made by the authorities concerned of the Governments of Republic of Botswana and Republic of Zambia.

The necessity for technical and economical feasibility of the Kazungula Bridge has been confirmed in the Study and implementation of the Project is recommended in the Report.

We sincerely hope that the Project contributes to economic growth between the two countries.

Finally, we wish to take this opportunity to express our sincere gratitude to the persons concerned of your agency, Embassy of Japan in Zambia, Embassy of Japan in South Africa, Honshu-Shikoku Bridge Authority, Japan Highway Public Corporation, Ministry of Works, Transportation and Communications, Republic of Botswana and Ministry of Works and Supply, and the Republic of Zambia for their cooperation and support extended to the Study Team.

Very truly yours,

March 2001

Koji ENOMOTO
Team Leader,
JICA Study Team
Nippon Koei Co.,Ltd

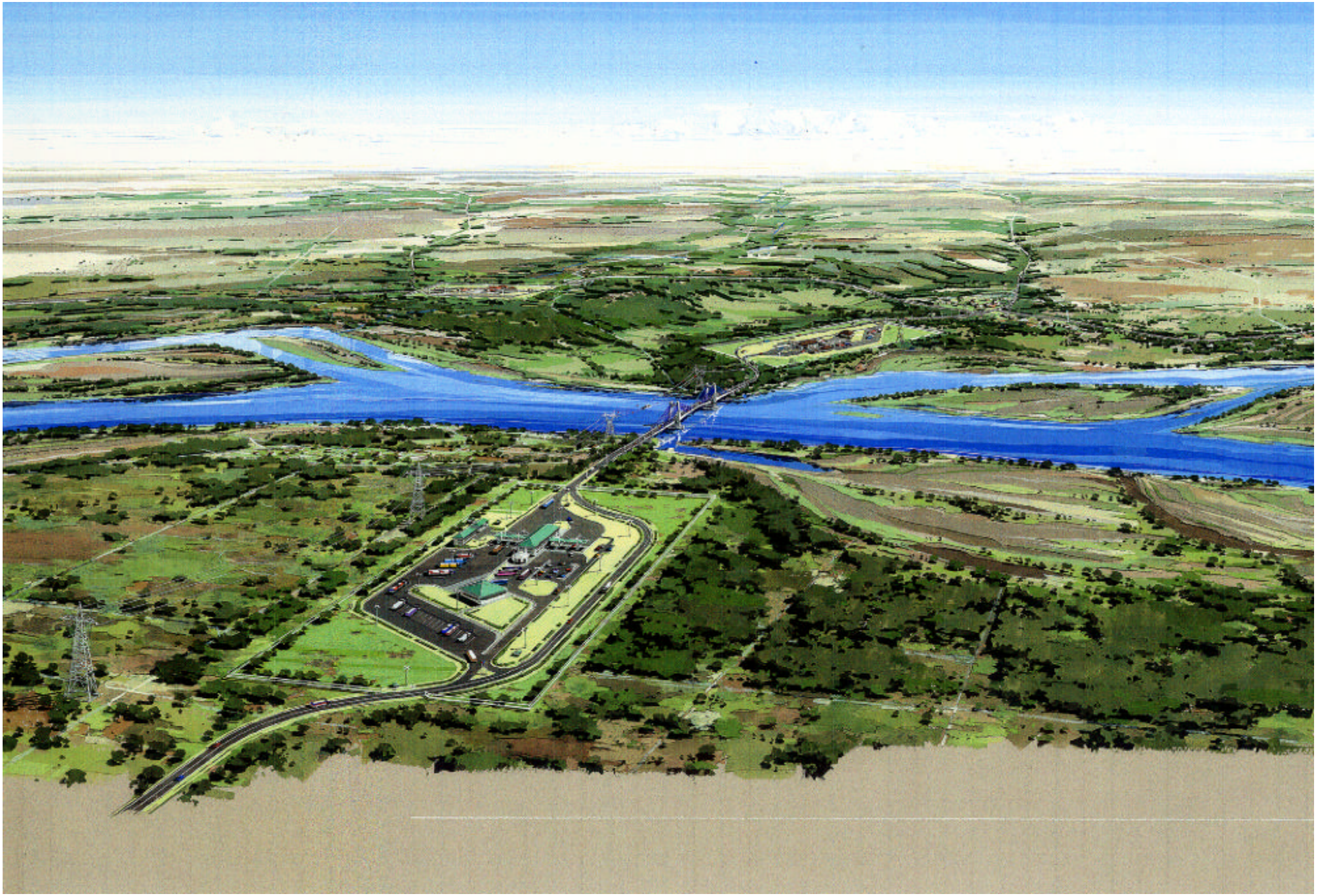
LEGEND

- Capital
- City
- International Boundary
- Main Road
- Railway
- National Park

THE FEASIBILITY STUDY ON
KAZUNGULA BRIDGE OVER THE ZAMBEZI RIVER BETWEEN
THE REPUBLIC OF BOTSWANA AND
THE REPUBLIC OF ZAMBIA

LOCATION MAP

Image of Kazungula Bridge



Bird's-eye View of Border Control Facilities

SYNOPSIS

1. Background

The Southern African Development Community (SADC) has increased the number of member states to fourteen following the admission of the People's Republic of Congo. Also, with peace developing in Angola and Mozambique, SADC is dynamically working to promote and activate the economies of the member states. This can only be achieved by promotion of the free and unobstructed movement of both cargo and people within and out of the region to improve its overall accessibility.

Botswana and Zambia are two of the major member states of SADC and play important economic roles in the region. However, free movement of trade goods and people between the two countries has been obstructed due to lack of a reliable road network across the Zambezi River. This has been one of the great causes of hindered economic integration among the member states of SADC.

The measure of river crossing at Kazungula, has been identified as one of the major bottlenecks requiring rectification in order to promote an unobstructed and free flow of traffic in SADC region. This can only be attained by construction of a bridge and by improvement of border facilities situated near the crossing.

The major objectives of the Project are as follows:

- To formulate development plans for Kazungula Bridge across the Zambezi River between Botswana and Zambia, and to formulate improvement plans for border facilities located near the bridge.

- To confirm technical & economic feasibility of the optimal development plan of the bridge and improvement plan of border facilities.

- To promote technical transfer of knowledge and technology.

2. Present Issues of Kazungula Crossing

At present, transportation across the Zambezi River is conducted at two river bridges: Chirundu bridge and Victoria Falls bridge, both located on the border between Zambia and Zimbabwe. These routes have the problems that the steep and winding route sections are bottleneck of transportation along the route, and a complicated customs clearance is causing delays at border.

Therefore, many vehicles divert their route to Kazungula crossing in recent years. As Kazungula crossing increases year by year, it is expected that the Project will greatly contribute to the regional economic development and integration of SADC economy in total as the Project is directly related to the North-South corridor

improvement in SADC region.

3. Socio-economic Framework and Future Traffic Level

Although the economy in SADC during the 1990s was stagnant, SADC holds brilliant prospects for the future economy. According to the "Transport and Communications Integration - the catalyst for economic development in South Africa", prepared by SATCC in 1998, export from SADC is forecasted to increase at about 4% per annum.

Traffic across the Zambezi River will grow in future in response to increased economic activities in SADC region and greater vehicle ownership and use. The economy of South Africa will continue to dominate the region, but significant economic growth is forecast for the Democratic Republic of Congo and Copperbelt in Zambia. By the year 2015 traffic crossing the Zambezi is forecast to grow by between 1.75 times (low growth scenario) and 2.56 times (high growth scenario).

4. Development Concept of Kazungula Crossing

For improvement planning of Kazungula crossing, the following items were studied, (1) Ferry improvement plan, (2) Bridge construction plan, and (3) Improvement plan of border control facility on the basis of socio-economic and political aspects, transportation aspects and technical aspects.

(1) Ferry improvement plan

The preliminary design for ferry facilities had to be examined in two cases, i.e. "with bridge" case and "without bridge" case in order to execute the ideal ferry operation.

In case of "with bridge" case, improvement work should be contained to a minimum level in consideration of its effect on bridge construction work and discontinuation of the ferry operation in future. On the other hand, in case of "without bridge" case, suitable ferry facilities have to be proposed in order to reduce traffic congestion in future. Planning components of ferry improvement are as follows:

1) With Bridge Case : Replacement of onshore ramp, dredging work of basin

2) Without Bridge Case : Reconstruction of onshore ramp, reconstruction and expansion of parking lot, construction of storage facility, replacement of engine, improvement of upper deck, replacement of propeller

(2) Bridge construction plan

As the Kazungula crossing way, bridge construction was planned over the Zambezi river other than above ferry improvement. The bridge construction plan included approach roads in both countries.

1) Crossing route

Crossing route of the shortest bridge length was selected in consideration of economy, construction issue, impact to some obstacle and boundary line.

2) Bridge type

As the main bridge, PC Extra-dosed type was selected for the reasons that it has superior points in construction costs, concrete works, economical design and environmental impact, compared with PC Box Girder and PC Cable-stayed bridge types.

(3) Improvement plan of border passing system

One-stop Border Post is recommended to be introduced in line with SADC's Protocol in August 1996 to reduce border delays among SADC nations. The separated type, where each border control facility is located in each individual country, has been selected for its lower construction cost, less maintenance work, and effectiveness in usage. Border facility plan, including layout of the buildings and parking areas, was designed, taking into account future traffic volume, procedure of border clearance, aesthetics and environmental factors.

5. Evaluation of Development Plans of Kazungula Crossing

(1) Environmental Consideration

There exist national parks and wild animal protection areas nearby the project site, and there exist towns and villages on both side of the Zambezi River at the site. In order to minimise negative impacts on the ecology and human settlement, special consideration was paid in the designing of bridge and access road in terms of their location, scale and structure. In addition to the above, measures to minimize the negative environmental impact during the construction work, including protections of water contamination, noise and vibration, were proposed.

(2) Economic evaluation

Three of the project components; the bridge at Kazungula, one-stop border

post and ferry improvement were individually evaluated. It was found that the bridge and the one-stop border are both economically feasible in high growth of traffic scenario with calculated Internal Rate of Return (IRR) of more than 12%, which is an official discount rates both for Botswana and Zambia. The ferry improvement plan was proved feasible in both high and low growth scenarios with calculated IRRs of more than 12% for both cases.

(3) Financial Consideration

According to the budget analysis of implementing agencies of Botswanan MWTC and Zambian MOWS, it could be concluded that both government agencies are not capable of catering to the total project cost but can cater to annual maintenance cost of the project after the completion.

Good result of Financial Internal Rate of Return (FIRR), calculated under relatively low level of optimal toll rate (passenger car: $10, medium truck: $20, heavy truck: $30), suggests that the varieties of financing methods for project implementation is probable.

It is reasonable to propose that the project should be financed by international financing method, should the details of implementation method and responsibilities of each country and so on be clearly decided in the negotiation among the relevant Governments.

There are essentially only two possibilities of international financing measure for the project as described below:

- Separate financing to Botswana and Zambia from international financiers
- Financing to the representative government which could be either Botswana or Zambia. The details of financial conditions, owner ship of property, and conditions for redemption of fund, and so on would have to be discussed among the relevant parties.

(4) Indirect effects of the Project

The project shall produce the following indirect benefits which justify the socio-economic viability of the project.

1) Impact on SADC Integrity

- Strengthening of socio-economic and political integrity among SADC nations,

- Inducement of balanced economic development among SADC nations in a long term, with the realisation of homogeneous regional economies,
- Expansion of South African economic sphere within SADC and promotion of specialisation in industrial activities among SADC nations, and
- Promotion of succeeding border facility improvement projects at borders among SADC countries.

2) Effects on National Economies

- Enhancement of GDPs,
- Strengthening of inter-dependencies among domestic industries,
- Reduction of socio-economic disparities between urban and rural areas,
- Promotion of employment, and
- Expansion of export/import.

3) Effects on Regional Economies

- Promotion of local industries,
- Enhancement of farm-gate prices of agricultural products due to reduction of transportation cost,
- Reduction of consumer's prices of agricultural products due to reduction of transportation cost,
- Activation of socio-economic activities at community level, and resultant tax revenue increase for local governments, and
- Promotion of area-wise development plans including those at community levels.

4) Effects on Transportation

- Promotion of new type of transportation methods including containerised transportation system,
- Realisation of reliable transportation system that is not affected by weather,
- Reduction of damages to cargo and preservation of freight values,
- Promotion of related road development plans, and
- Development of transportation infrastructure for tourism promotion.

5) Others

- Control on smuggling, drug abuse and terrorism,

- Prevention of epidemic and control on HIV infection,
- Reduction of traffic accidents, and
- Dissemination of outside information, especially in the case of emergency.

6. Conclusions and recommendations

(1) Project outline

Project package on this Project will be divided into two packages due to different characteristics in terms of administrative and technical points. Package-1 consists of the bridge and approach roads. Package-2 consists of three border control facilities. The project outlines are:

Package-1

-	Total project length of Bridge and Approach Roads	:	3,700 m
-	Total Bridge Length	:	720 m
-	Main Bridge Length (PC Extra-dosed Bridge)	:	465 m
-	Approach Road (Zambia side)	:	1,383 m
-	Approach Road (Botswana side)	:	1,597 m
-	Total Approach Roads Length	:	2,980 m

Package-2

-	Border Control Facility (Zambia)	:	15.8 ha
-	Border Control Facility (Botswana)	:	17.1 ha
-	Border Control Facility (Zimbabwe)	:	12.4 ha
-	Passing Road (Zimbabwe)	:	600 m

(2) Project cost

The project cost and its breakdown are (unit: 1,000 USD) described as below:

-	Construction Cost	:	47,668
-	Engineering Cost	:	4,766
-	Administration Cost	:	2,860
-	Land Acquisition and Compensation	:	7
-	Price Escalation & Physical Contingency, etc.	:	9,533
-	Duty Tax (VAT)	:	4,766
	Total Project Cost	:	70,317

(3) Implementation program and tentative schedule

The overall implementation program and tentative schedule are proposed as below:

- Procurement of Consultant : 6 months (July 2001 - Dec. 2001)
- Detailed Design :12 months (Jan. 2002 - Dec. 2002)
- PQ & Tendering :12 months (Jan. 2003 - Dec. 2003)
- Construction
  Package-1 (Bridge Approach Roads) :39 months (Jan. 2004 - March 2007)
  Package-2 (Border Control Facilities) :33 months (July 2004 - March 2007)

(4) Financial procurement plan

With regard to the international financing of this bilateral project, either of the following methods is probable:

- Method 1: Separate finance to Botswana and Zambia
- Method 2: Finance to one of the governments that is a representative of the project implementation body

In either case, it is recommended that the governments of Botswana and Zambia should establish a joint committee for the project preparation at an early stage of time.

(5) Recommendation towards materialisation of the Project

Toward the materialisation of the Project, it is inevitable to settle the international boundaries within the site among the Governments concerned. In the meantime, a Project Management Joint Committee, responsible for arrangement of the project financial source(s), determination of the property ownership and the Project implementation/ procurement method, and setting up of project management policy and maintenance strategy, and establishing an Environmental Management Sub-committee, should be formulated with the initiative of the Governments of Botswana and Zambia.