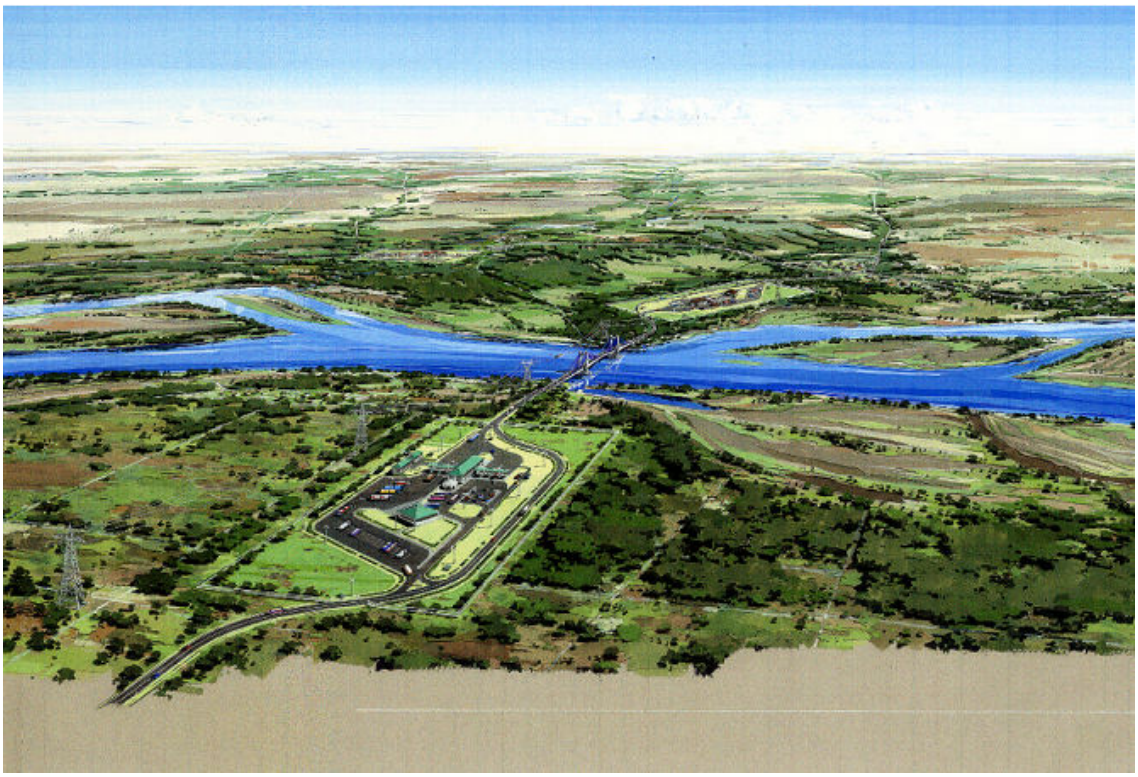
Briefing Memorandum:

The Kazungula Bridge – Botswana-Zambia



ICA Meeting:

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1. Summary

The Kazungula Bridge Project consists of the construction of a bridge across the Zambezi River between Botswana and Zambia, as well as the improvement of border facilities situated near the crossing. The main objective of the Kazungula Bridge is to replace the ferry service between the two countries, which suffers from slow traffic clearance as a result of limited carrying capacity.

The bridge will form an important part of the trade infrastructure of the Southern African Development Community (SADC) and the African continent. The construction of the Kazungula Bridge would enhance transport operations along the regional north-south corridor, which links the mineral-rich regions of Zambia and the Democratic Republic of the Congo to Botswana and the port of Durban in South Africa. In light of its importance, the Japan International Cooperation Agency (JICA) commissioned a study by Nippon Koei and Oriental Consultant. The study, published in March 2001, confirmed the technical and economic feasibility the project.

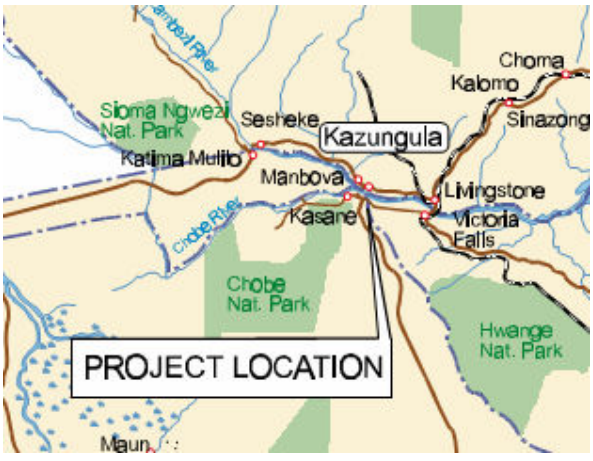
The total cost for the Kazungula Bridge is estimated at US$ 70 million, with an additional US$ 30 million required for the border control facilities. Nippon Koei and Oriental Consultants have estimated that the construction would take 4 years, excluding engineering studies. They also estimate total project revenues of US$ 360 to US$ 605 million over a period of 30 years, resulting in a Financial Internal Rate of Return between 5% and 14%, depending on the toll rate.

The African Development Bank is currently sponsoring a North-South Corridor improvement study conducted by SADC and outside consultants, which is expected to be concluded by the spring of 2008. The Kazungula Bridge will be part of this study.

2. The Project

2.1. Description

Figure 1 : Location of the Kazungula Bridge



The project site is located on the Zambezi River in Central Southern Africa, 65 kilometres upstream of Victoria Falls.

The Zambezi River originates in the north-western region of Zambia and flows southward through the eastern area of Angola and the western area of Zambia. During the dry season, the Zambezi River has a width of approximately 400 metres, widening to 800 metres during flood season. The average depth of the river is about 7 metres in dry season and rises by around 5 metres during flood season.

The terrain on both sides of the riverbank is very flat, and is covered with shallow floodwater during flood season.

2.2 Technical Features

The JICA-sponsored study proposes a two-lane bridge with a one-metre sidewalk. The total length of the bridge is 720 metres, 465 metres of which relate to the main bridge span. Additional facilities associated with the Kazungula Bridge Project include a 3-kilometre approach road, One-Stop-Border Posts, and tolling facilities. Nippon Koei and Oriental Consultants recommend a PC Extra Does bridge type for the project.

2.3 International Borders

Figure [2]:Overview

The potential construction site of the Kazungula Bridge covers an area where three international boundaries converge (see figure [2]). The boundary between Zambia and Namibia as well as that of Zambia and Zimbabwe is defined by the centre line of the Zambezi River, while the boundary between Botswana and Namibia is defined by the centre line of the Chobe River. The latter flows into the Zambezi River immediately upstream of the existing ferry operation line. On the right riverbank of the Zambezi River near the ferry onshore ramp, the boundary is defined by a steel peg in a concrete foundation. From this point, the border fence extends inland.

2.4 Existing Ferry Operations

Ferry services have operated between the Botswana and Zambezi River since 1979, using 70-ton class ferry boats.

The width of the ferry crossing is approximately 450 metres during low flow season and 700 metres during flood season. Operating hours of the ferry are 6:00 to 18:00, after which the ferry boats are anchored in an estuary on the left riverbank of the Zambezi River. It will be crucial to maintain the existing ferry operation during the bridge construction period in order to enable the continued flow of traffic.

2.5 Environmental Considerations

The area along the Zambezi River includes the Chobe National Park, the Kasane Forest Extension and the Matetsi Safari Area, as well as towns and villages on both sides of the River.

In order to minimize the negative environmental impact of this project, special considerations in terms of the design, location, scale and structure of the bridge need to be addressed. Furthermore, during the construction period, efforts should be made to limit water contamination, noise and vibration which could adversely affect the local community.

3. Economic Rationale

3.1 Unique Features of the Kazungula Bridge

The Zambezi River is a significant barrier to the movement of goods in Southern Africa. Virtually all traffic between South Africa, Botswana, Mozambique, Zimbabwe, Zambia, Congo, Tanzania and Malawi depends on this specific transport corridor. The construction of the Kazungula Bridge would enhance transport operations along the regional north-south corridor, which links the mineral-rich regions of Zambia and the Democratic Republic of the Congo to Botswana and the port of Durban in South Africa.

Forecasts of traffic patterns following construction of the Kazungula Bridge predict that, by 2015 traffic crossing the Zambezi will grow between 1.75 times (low growth scenario) and 2.56 times (high growth scenario).

In addition, the construction of the Kazungula Bridge will most likely promote local industry in Zambia, Zimbabwe and Botswana. The reduction of local transportation costs will potentially lead to the reduction of consumer prices of agricultural products, as well as the development of socio-economic activities at community level. This increase in local economic activity can result in an increase of tax revenues for the local government.

3.2 Existing River Bridges

At present, transportation across the Zambezi River is conducted at two river bridges: the Chirundu Bridge and Victoria Falls Bridge, both located on the border between Zambia and Zimbabwe. These two routes have the problem that steep and winding sections act as transportation bottlenecks, and complicated customs clearances are causing further delays at the border. Therefore, in recent years many vehicles have shifted their route to the Kazungula crossing.

As traffic to the Kazungula crossing increases year by year, it is expected that the project will greatly contribute to the regional economic development and integration of the SADC economy, since the project is directly related to the overall Botswana/Zambia North-South Corridor improvement study currently conducted by SADC and outside consultants.

3.3 Future Economic Prospects

Botswana and Zambia are both major member states of SADC and they both play an important economic role in the region. However, free movement of trade goods and people between the two countries has been obstructed due to the lack of a reliable road network across the Zambezi River. The Kazungula bridge could significantly contribute to the reduction of the number of bottlenecks that are hindering further integration.

Stable economic development in the SADC region provides the basis for future economic development. Economic growth for the region is projected at approximately 7 percent for 2007. Zambia's real GDP growth in 2006 was estimated to be 5.8 percent, while Botswana had a real GDP growth of 5.4 percent in 2006. The SADC region is endowed with untapped natural resources of minerals, fuels and vast agricultural lands that can enhance economic development in the future. Structural adjustment efforts and deregulation policies adopted over the past decade may also function as a catalyst of future economic development.

3.4 Traffic Forecast

Nippon Koei and Oriental Consultants have set a 15-year traffic forecast horizon for their projections. The forecast is based on the average annual GNP growth rates in each of SADC's 30 traffic zones. The feasibility study subsequently employed a high- and a low economic growth scenario to predict future traffic flows. In addition, the study examines the option of improvements in current ferry operations (Case 1) as an alternative to the construction of the Kazungula Bridge (Case 2).

Forecasted traffic volumes for the five potential Zambezi River crossing points, using high- and low-growth scenarios and looking at both cases have been summarized in the figure below:

Table 1 : Traffic Forecast in the year 2015

	Low Traffic Growth		High Traffic Growth	
	Case1	Case2	Case1	Case2
	Improved Ferry Operation	Bridge at Kazungula	Improved Ferry Operation	Bridge at Kazungula
Katima Mulilo	65.9	32.3	78.7	40.0
Kazungula	276.0	349.1	387.9	475.0
Victoria Falls	72.2	68.8	84.4	78.4
Chirundu	322.9	299.5	432.6	412.9
Kalongola	15.0	2.3	119.2	96.5
Total	752.0	752.0	1102.8	1102.8

Table 1 shows that the construction of the Kazungula Bridge will result in a greater proportion traffic diverting to the new bridge, resulting in lighter traffic loads elsewhere.

This is the case in both the high traffic growth (8.56% p.a.) and the low traffic growth (6.36% p.a.) scenarios.

4. Financial Feasibility Analysis

4.1 Overall Project Assumptions

According to JICA, construction will take 4 years (excluding engineering studies) and all cash flows are based on an initial project life of 30 years.

4.2 Project Operations and Maintenance

Prior to completion of the bridge, a Management Committee for operation and maintenance will be organized in both Zambia and Botswana. After completion, the operation and maintenance of the bridge will be carried out under each country's committee. Each country will be also responsible for its approach roads, border facilities, customs, etc.

4.3 Project Costs

According to the feasibility study, the project costs can be divided into two packages. Project package 1 consists of bridges and approach roads (Zambia, Botswana and Zimbabwe). Package 2 consists of the border control facilities (Zambia, Botswana and Zimbabwe). The total project cost for Packages 1 and 2 are shown below and are based on the calculations of the consultants.

Table 2

Package 1: Kazungula Bridge Costs ($'000)			*Foreign Content*
Bridge	45,339		
Approach Road	2,271		
Ferry Facility	58		
1) Construction cost		47,668	***80%***
Details design	2,383		
Construction supervision	2,383		
Environmental monitoring	46		
2) Engineering cost		4,812	***100%***
Administration cost	486		
Maintenance cost (25year)	2,383		
3) Administration cost		2,869	
4) Land acquisition (Re-vegetation) and compensation cost		6	
5) Price escalation (10%)		4,766	
6) Physical contingency (10%)		4,766	
7) Interest during construction		715	
8) Duty tax (VAT) (10%)		4,766	
Total		**70,368**	***71.80%***

Table 3

Package 2: Border Control Facilities Cost ($'000)			Foreign Content
Border control facility	15,437		
1) Construction cost		15,437	7%
Detail design	1,157		
Construction Supervision	1,157		
Environmental monitoring	5		
2) Engineering costs		2,319	
Administration cost	154		
Operation and Maintenance cost (25year)	7,718		
3) Administration cost		7,872	100%
4) Land acquisition (Re-vegetation) and compensation cost		60	
5) Price Escalation (10%)		1,543	
6) Physical contingency (10%)		1,543	
7)Interest during construction		231	
8) Duty tax (VAT) (10%)		1,543	
Total		**30,548**	11.80%

4.4 Tolling and Traffic

As the bridge is an alternative to existing ferry services, where a crossing fee is already charged, the JICA-sponsored study expects that the bridge will be operated under a toll system. The revenue from the toll bridge would be appropriated for refunding the international and private financing loans and to cover the maintenance of the bridge.

In determining the optimal toll rate for the bridge, JICA considered two different approaches, the "Willing to Pay Principle" and the "Redemption Principle," as explained below:

The "Willing to Pay" principle assumes that the toll rate will be determined by the level of the benefit that users receive from project. Benefits in this case are cost of time (COT) savings, and vehicle operation cost (VOC) savings.

The "Redemption Principle" assumes that the toll rate is set at a level that can recover project costs during the operating period.

Nippon Koei and Oriental Consultants calculated a *base case* scenario, an *alternative base case* scenario, and an *optimal toll rate* scenario for the bridge. The Base case scenario assumes a toll rate that corresponds to existing ferry charges (i.e. US$ 20 for cars, US$ 55 for buses and medium trucks, and US$ 70 for heavy trucks)

The alternative base case scenario is based on a toll rate corresponding to about 70 percent of existing ferry charges (i.e. US$ 15 for cars, US$ 40 for buses, and US$ 50 for heavy trucks).

The optimal toll rate is based on the time consumers save by using the Kazungula Bridge and the associated monetary savings. This rate is the least expensive alternative for bridge users. The optimal toll rate price is US$10 for cars, US$20 for buses and US$30 for heavy trucks, making it the most attractive for all three segments.

Table 4 : Ferry Charges

	Vehicle Registered in Zambia		Vehicle Registered in Other Countries		
	(Kwacha)	(US$ Equivalent)	US$	Rand	Pula
Passenger Car	11,000	3.06	20	70	40
Taxi	16,000	4.44	20	70	40
Mini Bus (Private)	20,000	5.56	30	106	70
Mini Bus (Public)	23,000	6.39	30	106	70
Bus	39,000	10.83	35	140	105
Medium Truck	50,000	13.89	55	215	135
Truck (3axle)	53,000	14.72	65	235	190
Truck (4axle and over)	67,000	18.61	70	260	195
Trailer	53,000	14.72	-	-	-
Tractor with Trailer	21,500	5.97	-	-	-
Tractor	17,500	4.86	-	-	-
Bike	8,000	2.22	-	-	-
Jeep	16,000	4.44	-	-	-

Employing high and low traffic growth rates as outlined above (8.56% p.a. and 6.36% p.a. respectively), the following traffic volumes are derived:

Table 5 : Traffic Volume corresponding to Toll rate

		Unit: Vehicles/day	
		High growth	Low Growth
Base case	:	464	341
Alternative of Base Case	:	474	348
Optimal Toll Rate	:	483	355

Since the optimal toll rate will be the most consumer friendly toll rate, traffic volume is predicted to grow to the greatest degree in the optimal toll rate scenario.

4.6 FIRR

Based on the three different toll rates, as well as the cost and the traffic demand figures for low and high growth, Nippon Koei and Oriental Consultants calculated cost revenue flows for future bridge operations over a 30-year period. Under the base case scenario, revenues are set to reach US$ 605 million for the high growth scenario and US$ 360 million for the low growth scenario (i.e. a toll rate corresponds to existing ferry charges), which is equivalent to 10.7x and 6.4x the total cost of the project. Should a toll rate hike be introduced in the future, a higher FIRR would be obtained, strengthening the financial viability of the toll bridge.

This cost and revenue flow analysis results in an FIRR of 14.4% for the 'Base Case, High Growth Scenario' and an FIRR of 11.5% for the Base Case, Low Growth Scenario'. An FIRR between 5% and 8% percent was calculated for the optimal toll rate.

Table 6: FIRR by Toll rate

	Base Case	Alternative Base Case	Optimal Toll Rate
High Growth Scenario	14.44%	11.96%	8.39%
Low Growth Scenario	11.45%	9.10%	5.71%

4.6 Feasibility Evaluation

The analysis suggests that the revenues from the toll bridge can cover a significant portion of the project cost. The feasibility study recommends that various financing alternatives be considered, notably public and private financing as well multilateral financing.

Although the lower toll rate may be more user-friendly, the analysis suggests that a higher toll rate would be required to attract private sector participation. Higher toll rates can be justified by comparison with the current cost of the ferry service.

5. Project Contacts

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6. Next Steps

On October 29, 2006, the governments of Zambia, Botswana and Zimbabwe signed a Memorandum of Understanding (MoU) on the detailed study of the Kazungula Bridge. On November 21, 2006, the African Development Bank approved a grant amounting to US$ 2.2 million for the SADC North-South Corridor Improvement Study, which includes the Kazungula Bridge. The SADC Secretariat is the implementing agency for the study and the objective of the study is to prepare an update on the economic feasibility, detailed engineering design, and tender documents for the Kazungula Bridge and other key infrastructure facilities along the SADC North-South Corridor within Botswana and Zambia.

The overall coordination of the study is currently administered by the Joint Steering Committee, chaired by the Executive Secretary of SADC and comprising the Permanent Secretary for the Ministry of Works and Transport (Botswana), the Permanent Secretary for the Ministry of Works and Supply (Zambia), a representative of the Secretary for Economic Affairs, Ministry of Finance (Botswana) and a representative of the Secretary to Treasury, Ministry of Finance and National Planning (Zambia). The committee is involved in the review of interim reports for the studies and held its last meeting on 26th February 2007

In the spring of 2008, SADC will have finished the design study of the Kazungula Bridge, at which point final development plans will be finalized. According to the financial and economic evaluation conducted under the JICA study, the high internal rate of return suggests that the project has the potential to use private financing under such methods as Build-Own-Transfer (BOT). The SADC design study will provide updated data and information on the Kazungula Bridge, and the government of Botswana and Zambia hope that construction can begin in the summer of 2008.

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