



THE 8TH ASEAN LEADERSHIP FORUM 2011
ENHANCING ASEAN CONNECTIVITY
FROM MASTER PLAN TO IMPLEMENTATION

PRESENTATION BY DATUK LIM SUE BENG
9th May 2011
Nikko Hotel, Jakarta

CONCEPTUAL DESIGN FOR THE STRAIT OF MALACCA

PROPOSED BY:

STRAIT OF MALACCA PARTNERS SDN. BHD.

DESIGNED BY:

HUNAN PROVINCIAL COMMUNICATION
PLANNING, SURVEY & DESIGN INSTITUTE



The Strait of Malacca

Linking Indian Ocean and Pacific Ocean, one of the busiest straits in the world.



Navigation Clearance

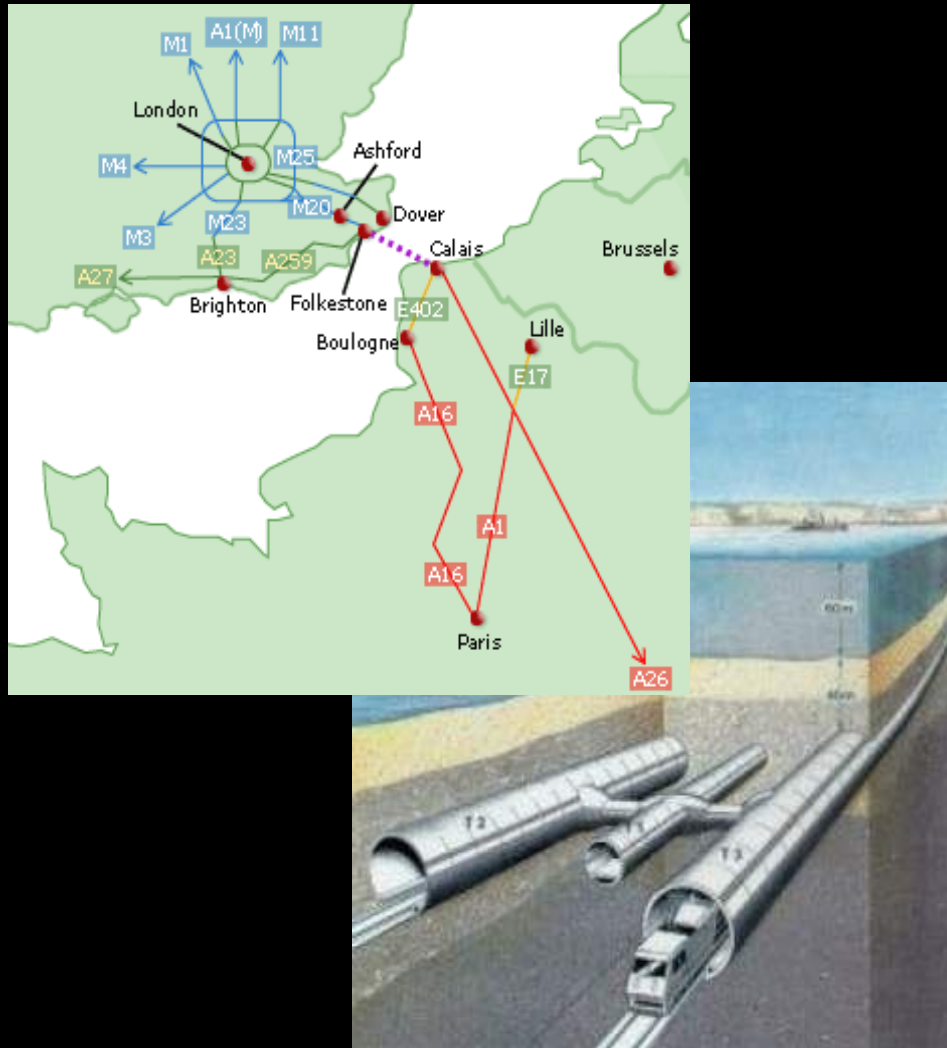
Item		Chandlery ship	Bulk cargo ship	Oil tanker	Container ship	Aircraft carrier	Passenger ship
DWT(t)		40,000	250,000	300,000	150,000		
Total length of ship (m)		207	329	348	398	330	345
Total width of ship (m)		32.3	55.7	65.1	56.4	42	56
Height above the water surface on condition of no load H (m)		45.54	55.60	57.51			72
Navigation width B (m)	One-way single ship	262	492	680	471	401	500
	One-way double ships	495	884	1128	892	727	899
Navigation height H (m)	$H=H_1+4.0m$	49.54	59.60	61.51	76	76	76



One-way single ship

One-way double ships

Euro Tunnel, UK and France



- Total length of the tunnel is **51km** and the construction cost totals **USD 15.4 billion**.

Commenced in 1986 ,
completed in 1994 with
the concession period of
65 years.

The Hong Kong – Zhuhai – Macao Bridge

It is a sea-crossing passage linking Hongkong, Zhuhai and Macao. Commenced in 2009 and to be completed in 2012 the construction cost will be **USD 10.64 billion**.

Bridge-tunnel combined scheme, including two man-made islands, a **6.6km** long undersea immersed tunnel and a **28.9km** long bridge; and total length: **35.6km**.



Aizhai Suspension Bridge China (Designed by HNCDI)

It is a suspension bridge with a main span of **1176m**. Currently under construction.



Proposed Schemes

For the strait part, we have carried out the comparison of the 3 option schemes in the initial feasibility study:

Bridge scheme

Bridge-tunnel combination scheme

Tunnel scheme

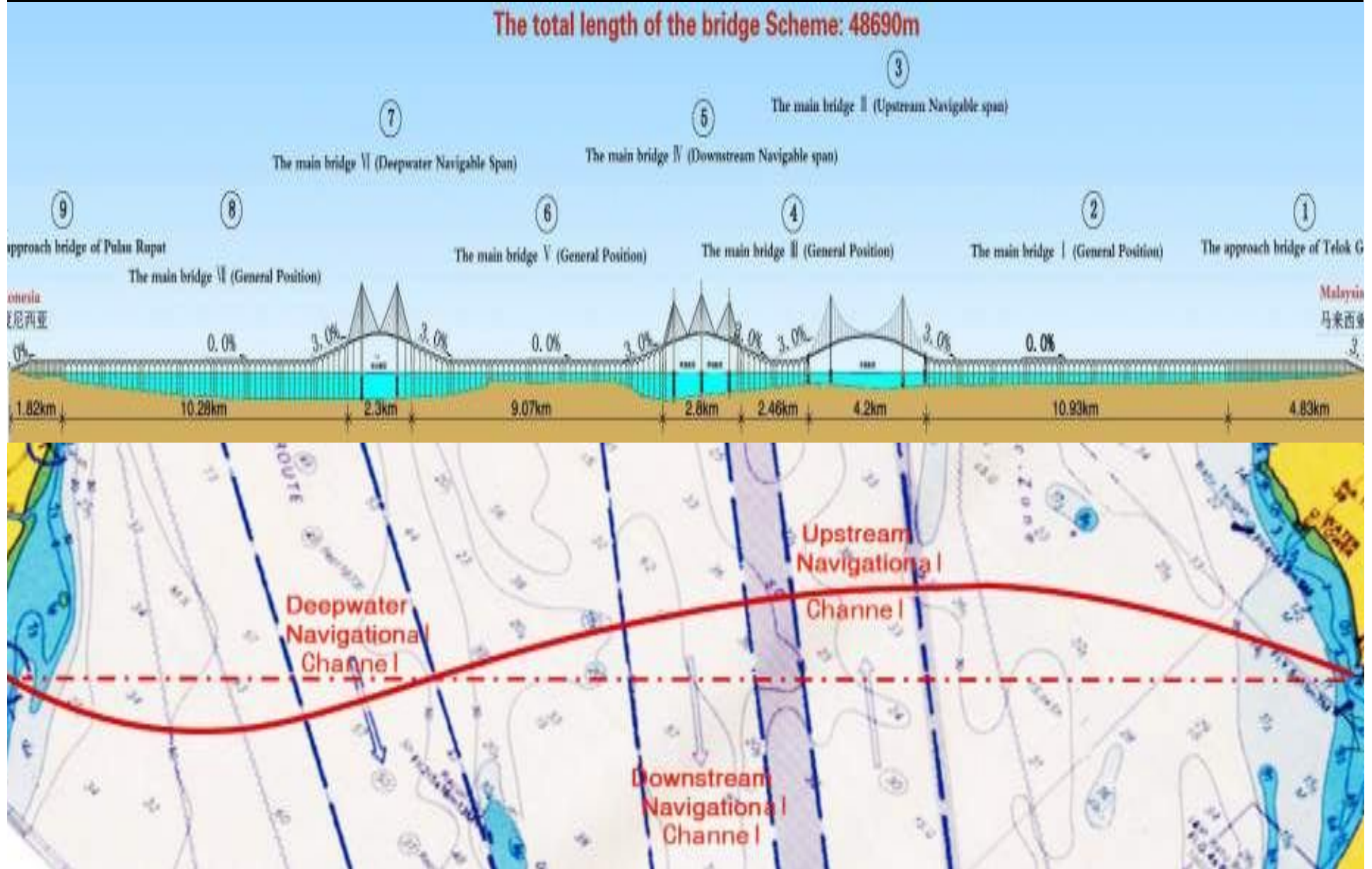
Proposed Schemes

The total length of the sea-crossing project will be **127.93km**, which includes a **48.69km** strait part, and a **79.24km** connecting works in Indonesia. The project will adopt dual-3 carriage lanes. (i.e. 3 lane in each direction)

Design Life: 120 years

Bridge Scheme

The total length for the bridge scheme of the strait part is 48.69km.



Main Bridge across the Upstream navigation channel



The main bridge across the upstream navigational channel will be a suspension bridge with span arrangement of 800m + **2600m** + 800m.

It will be the world's longest suspension bridge. The total length will be 4.2 km and water depth is 25~35m.

A single span is used for the upstream navigation channel so as to avoid collision accidents of ships, thus ensuring the safety of both bridge and ships.

Main Bridge across the Downstream navigation channel



The main bridge across the downstream navigation channel is designed to be a **2.8km** triple-tower cable stayed bridge with its span arrangement of

105m+295m+1000m+1000m+295m +105m.

The water depth is about 55m. Each of the two 1000m spans is used for one-way single ship downstream navigation channel.

Main Bridge across Deepwater Navigation Channel



The main bridge across deepwater navigation span is designed to be a **2.3km** cable stayed bridge with its span arrangement of

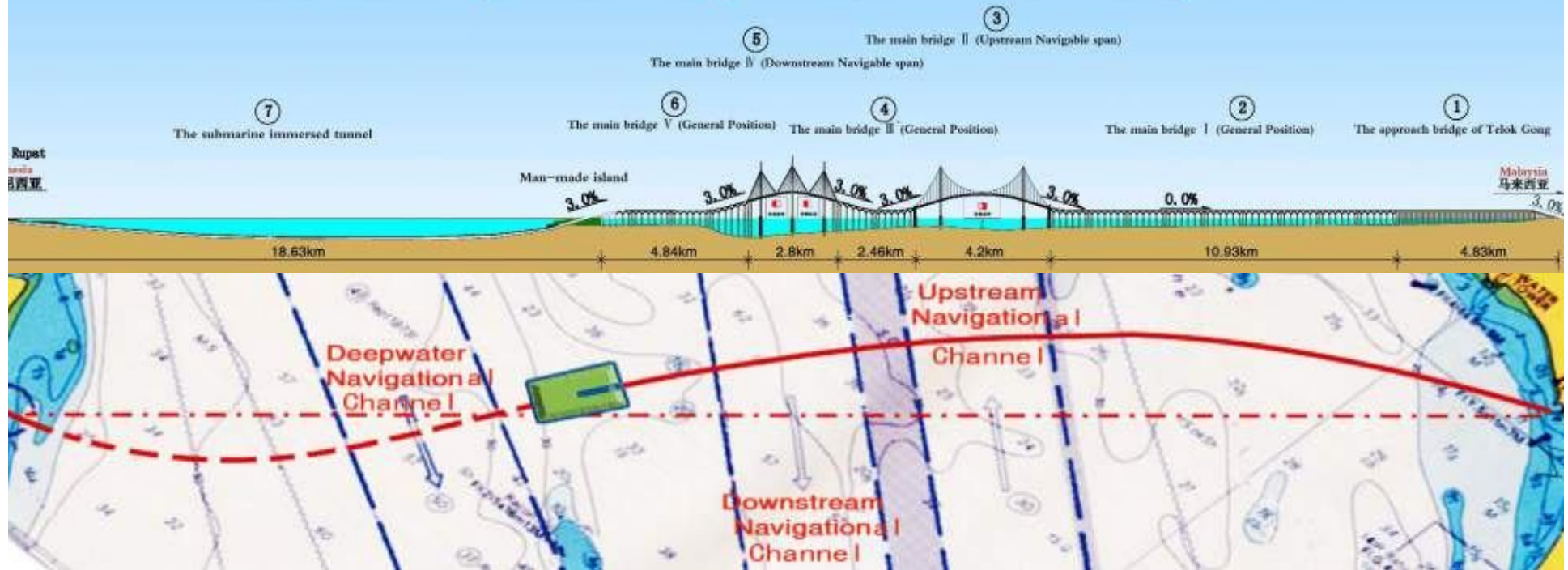
210m + 300m + **1280m** + 300m + 210m.

It will be the world's longest cable stayed bridge .The water depth is about 50~60m.

The deepwater navigation channel is crossed by a single main span.

Bridge-Tunnel Scheme

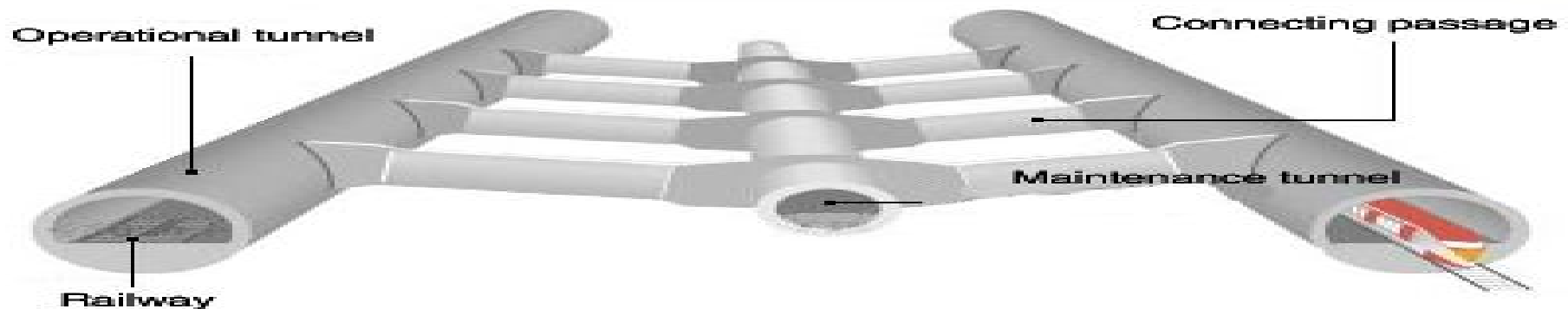
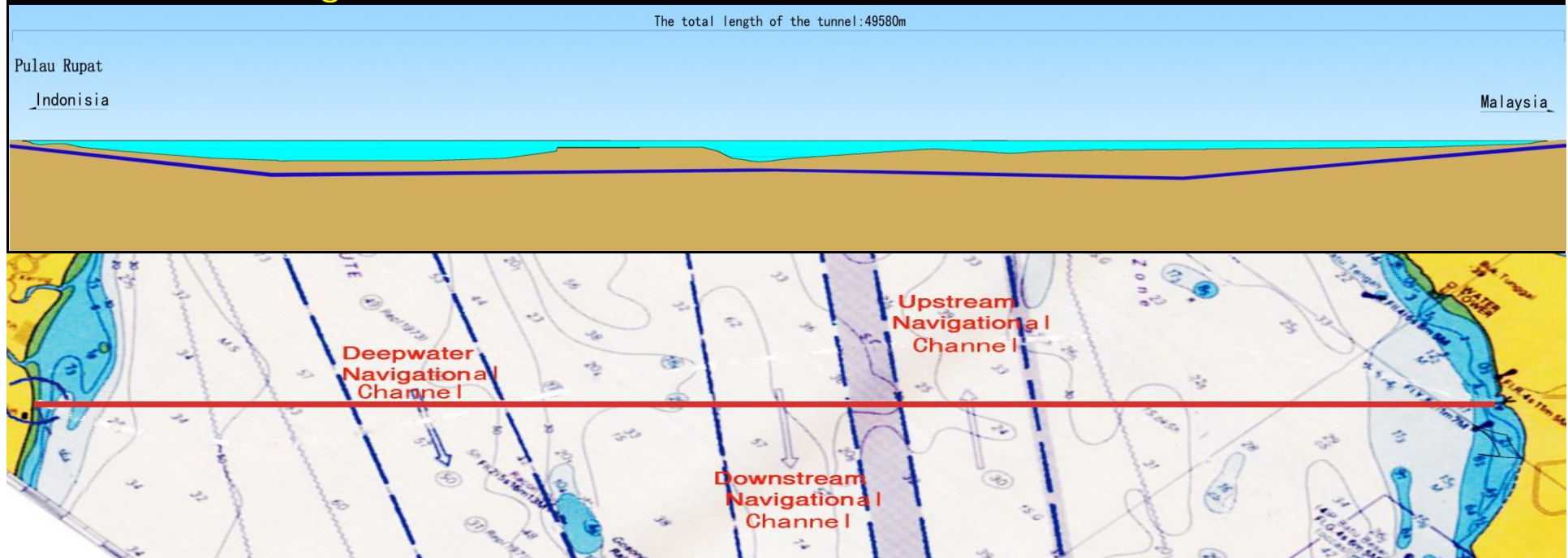
The Malacca Strait Bridge is 30060 meters long in the total, the tunnel is 18630 meters long in the total



The total length for the bridge-tunnel scheme of the strait part is 48.69km.

Tunnel Scheme

The Strait part will be undersea tunnel along the whole strait. The shuttling machine track transport will be used. The tunnel has a circular cross section with a total length of 49.58km.



Tentative Programme

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Feasibility Study	■	■								
Preliminary Design		■	■							
Detailed Design			■	■						
Tender				■						
Construction					■	■	■	■	■	■

Conclusion :

- I) The above 3 schemes are technically feasible
- II) Feasibility Studies should be immediately carried out to identify the most appropriate scheme.

**Financial Analysis Report
For
The Strait of Malacca Bridge Project**

Proposed by:
Strait of Malacca Partners Sdn Bhd

Designed by:
**Hunan Provincial Communications Planning,
Survey & Design Institute**

Financial Analysis Indicators

- 3 assumptions of the starting traffic volume, i.e. AADT=10,000 pcu/d (assumption A), AADT=20,000 pcu/d (assumption B) and AADT=30,000 pcu/d (assumption C) ;
- 1 & 2 represent two toll rate schemes, i.e. scheme 1 for US\$ 50/ pcu, scheme 2 for US\$ 100/ pcu.
- Datum discount rate is 3.18%.

Construction Cost of the Project

Name		Length (km)	Cost (US\$million)	Fee (US\$ million)	
Cost of construction and installation	Bridge Plan	Approach bridge of 70m	6.650	325.90	9,054.305
		Main bridge of 200m	32.740	3,339.0	
		Upstream navigable span	4.200	2,119.20	
		Downstream navigable span	2.800	1,139.10	
		Deep-water navigable span	2.300	834.50	
	Indonesia link	Road	71.240	872.80	
		Bridge	8.000	423.80	

Construction Cost of the Project

				US\$ million
Preliminary work cost for construction projects (design, inspection, measurement, research, etc.)				271.707
Reserved charges				815.120
Premiums				27.171
Total cost				10,440

Project Implementation

- Negotiation to be carried out with both government include:-
 - Toll Rates and its schedule of increments
 - Concession Period
 - Investment Amount and the period of investment
 - The participation of the government
 - The contribution to the government
 - Others
- The concession period for the project is proposed to be 10 years for development and 80 years for operation with a toll rate of USD\$ 80 per vehicle per way.

Toll Revenue of the Project

unit : US\$ Millions /year

Combination Schemes	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
A1	182.5	211.6	245.3	284.3	329.6	382.1	443.0	513.5	595.3	690.1	776.8
B1	365.0	423.1	490.5	568.7	659.2	764.2	886.0	1027.1	1190.6	1380.3	1553.5
C1	547.5	634.7	735.8	853.0	988.8	1146.3	1328.9	1540.6	1786.0	2070.4	2330.3
A2	365.0	423.1	490.5	568.7	659.2	764.2	886.0	1027.1	1190.6	1380.3	1553.5
B2	730.0	846.3	981.1	1137.3	1318.5	1528.5	1771.9	2054.1	2381.3	2760.6	3107.0
C2	1095.0	1269.4	1471.6	1706.0	1977.7	2292.7	2657.9	3081.2	3571.9	4140.8	4660.6

Financial Analysis Indicators

Combination Schemes	pre-financing analysis			re-financing analysis*	
	FNPV (millions US \$)	FIRR	P (year, including construction period)	FNPV (millions dollars US \$)	T (year, not including construction period)
A1	-3952	1.79%	41.3	0	>50
B1	2104	4.65%	26.9	2497	37.29
C1	8161	6.65%	20.8	8661	22.82
A2	2104	4.65%	26.9	2497	37.29
B2	14217	8.29%	17.4	14766	16.45
C2	26330	11.07%	13.7	26924	10.57

*(Loan @ 4% p.a.)

Conclusion

- The above financial index and sensitivity analysis showed that it is not feasible for A1 and it's feasible on the other conditions. But under the combination B1, there will be some risk.
- Due to the rising cost of materials the construction cost for the 3 schemes have been revised upwards.

Revised Construction Cost of the Project

Crossing Scheme	Sub-item Length	Construction Cost of Each Sub-item (USD billion)	Total Construction Cost (USD billion)
Bridge Scheme	Bridges: 48.69km	11	12.75
	Connecting works in Indonesia: 79.24km	1.75	
Bridge-Tunnel Scheme	Bridges: 30.06km	6.79	13.71
	Tunnels: 18.63km	4.54	
	Man-made Island	0.63	
	Connecting works in Indonesia: 79.24km	1.75	
Tunnel Scheme	Tunnels: 49.58km	13.30	15.05
	Connecting works in Indonesia: 79.24km	1.75	

KEY FACTORS IN FINANCING ASEAN CONNECTIVITY:-


- I) LOW INTEREST RATES
- II) LONGER CONCESSION PERIOD
- III) FAST IMPLEMENTATION

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