POLICY BRIEF

Accelerating Infrastructure Development in Indonesia

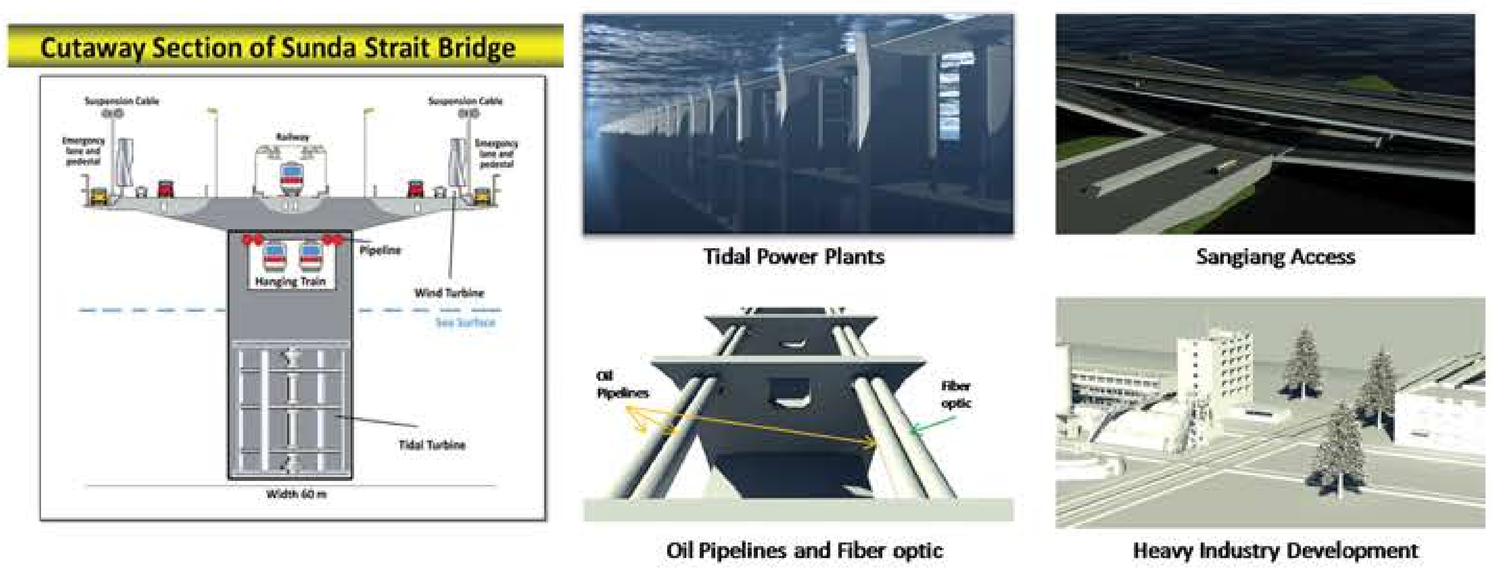
INNOVATIVE DESIGN OF SUNDA STRAIT BRIDGE

Indonesia is a vast archipelago country with large and dynamic economic activities reflected by an average economic growth reaching 6% per annum and has varied potential for development. Sunda Strait Bridge (SSB) is one of the mega projects offered by the Indonesian government as an initiative to connect Java and Sumatra Islands. Initially, it was offered as a US$ 10 billion project in 2008, due to its feasibility lacking, however, in 2011 it was revised into a US$ 25 billion project with additional scope of work, i.e. industrial area development along the site.

The SSB development requires comprehensive study in the aspects of planning, funding and construction techniques. The use of value engineering (VE) in the project design is expected to increase and to improve the project's feasibility. Research team in CSID produced an alternative design of SSB to attract private investment by generating innovative ideas.

Innovation in Sunda Strait Bridge (SSB) is driven by seeking potential resources located around the Sunda Strait; great wind, tidal current, potential tourism to be integrated in Sangiang and Prajurit Islands, efficient distribution of oil and gas as well as development of internet network between Java and Sumatra Islands.

Figure 1
Visualization of Sunda Strait Bridge Development



1st Edition/ September 2014

Center for Sustainable Infrastructure Development
Pusat Kajian Pembangunan Infrastruktur Berkelanjutan

POLICY BRIEF

Accelerating Infrastructure Development in Indonesia

For example kinetic energy generated by tidal currents can be used to produce electricity and provide a power supply for minimum-lighting in remote areas on both islands. In addition, the Sunda Strait Bridge span can be used as an alternative to place oil and gas transmission pipelines, as well as fiber optic cables in order to enhance information technology.

These potential resources and innovative ideas lead to the development of the proposed design by creating additional functions for the SSB: 1) Renewable kinetic energy generated by tidal current; 2) Integration of oil, gas and utility pipelines; 3) Tourism industrial development in Sangiang Island which can be accessed by road or hanging train; 4) The development of industrial areas in Banten and Lampung.

Life cycle cost (LCC) analysis was used according to the identified functions to calculate the project's feasibility by considering initial cost, operational and maintenance costs and revenue. The analysis of LCC shows the construction cost required to build SSB is about US$ 19.6 billion with US$ 2.9 billion of operational and maintenance costs for 27 years and it would be expected to gain revenue of about US$ 59.4 billion for the 27 years of the SSB operational life cycle. The SSB development with additional functions has been proven to increase the internal rate of return of the overall project by up to 7.26% and give a positive NPV value. The summary of LCC analysis can be seen in Table 1.

Table 1.
Summary of Life Cycle Cost Analysis

Function Components	Construction cost (US$)	O&M cost (2024-2050) (US$)	Revenue (2024-2050) (US$)
Transportation	10,626.45 million	2,201.98 million	15,541.96 million
Energy	1,143.78 million	562.13 million	7,132.38 million
Telecommunication	0.46 million	0.93 million	10.73 million
Tourism	4,163.31 million	108.74 million	27,036.75 million
Industrial Area	3,645.83 million		9,664.95 million
TOTAL	19,579.83 million	2,873.78 million	59,386.77 million

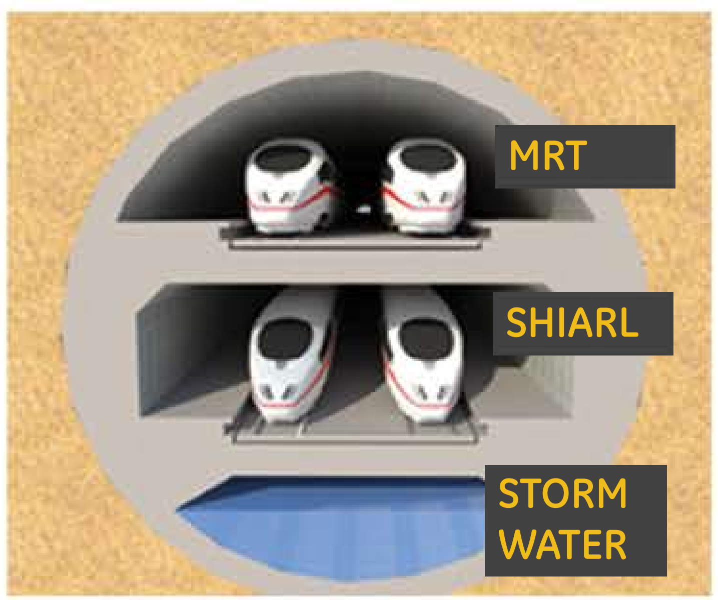
POLICY BRIEF

Accelerating Infrastructure Development in Indonesia

INNOVATIVE DESIGN OF PRASTI TUNNEL

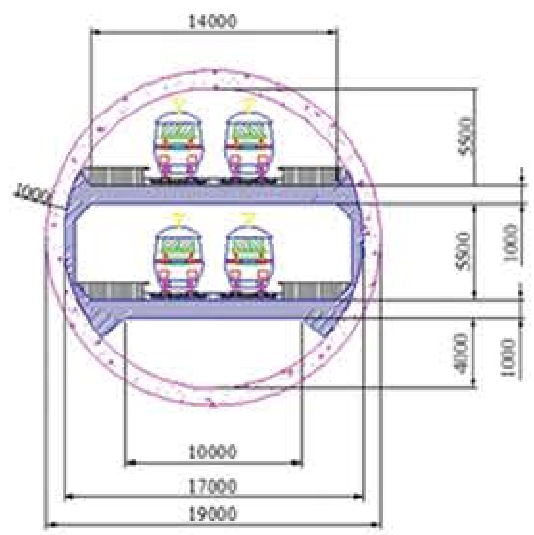
Greater Jakarta is suffering from various problematic transportation developments including devastating annual floods in the rainy season resulting in periodical interference of road accessibility which depends largely on the intercity and Sediyatmo highways. This dependency also leads to congestion and travel time uncertainty during peak hours. In 2011, the length of roads in Jakarta was about 6,866 km, which then increased to 6,955 km in 2012 (Ministry of Public Works 2013), which, when compared to over 1,000 new private vehicles sold every day (Jakarta metropolitan police, 2013), demonstrates that roads are taking great burden to accommodate all these vehicles every day.

Figure 2
Visualization of PRASTI Tunnel



As a result of this situation, rail-based transportation is required as an alternative solution to release traffic jams and reduce carbon emissions from vehicles.

Figure 3
Diameter Analysis of PRASTI Tunnel



The multifunction tunnel called Public RAilway and STormwater Infrastructure (PRASTI) Tunnel is proposed as an innovative solution to overcome the problems in Greater Jakarta using a Value Engineering (VE) approach through additional functions: 1) Transportation function consisting of MRT and Airport Rail, 2) Flood Control function, 3) Commercial Area function and 4) Utility (e.g. telecommunication) function. The tunnel itself will be divided into three levels; the first level serves as flood control, the second level serves as airport accessibility through SHIARL and the third level is expected to increase public transport through MRT lane.

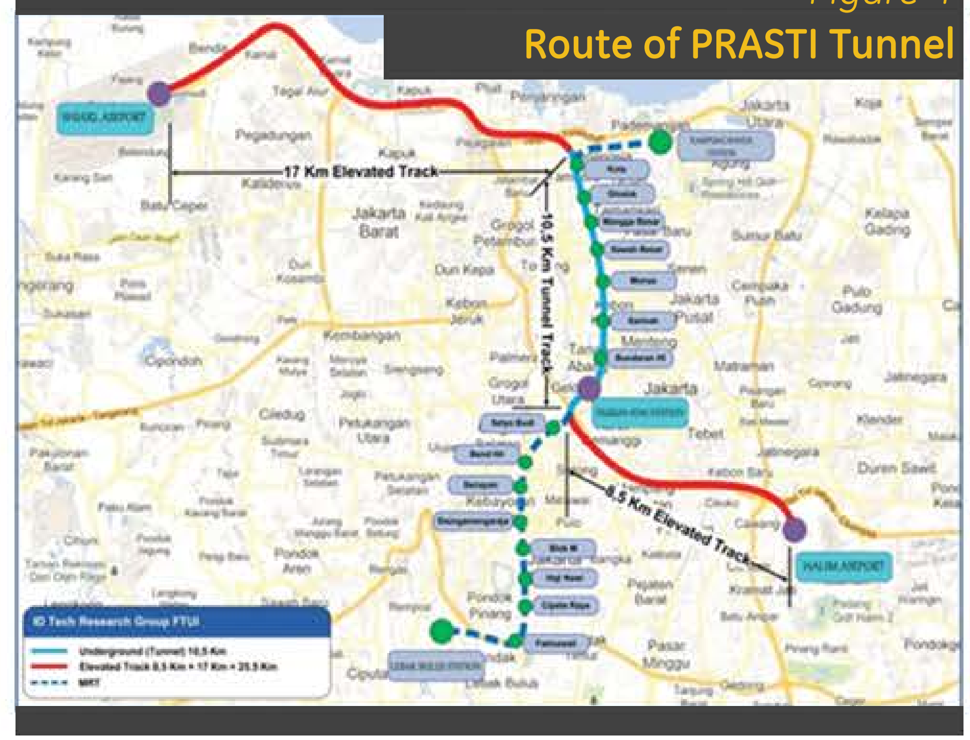
1st Edition/ September 2014

Center for Sustainable Infrastructure Development
Pusat Kajian Pembangunan Infrastruktur Berkelanjutan

POLICY BRIEF

Accelerating Infrastructure Development in Indonesia

Figure 4
Route of PRASTI Tunnel



Calculation of Life Cycle Cost analysis in PRASTI Tunnel involves construction cost and operational and maintenance cost by taking into account four functions: the Flood function; the Transportation function that consists of airport train and MRT; the telecommunication function; and commercial area development function.

The initial cost to construct PRASTI Tunnel is about US$ 2.2 billion with annual operational and maintenance cost around US$ 0.87 billion and produces a positive NPV and significant Internal Rate of Return (IRR).

Table 2.
Summary of PRASTI Tunnel Cost

PRASTI Tunnel Functions	Initial Cost (US$)	Annual Operational and Maintenance Cost (US$)
Flood Control Function	1,636,545,679.70	78,554,192.63
Transportation Function :		
a. Airport Train	44,161,875.00	622,575.00
b. MRT	49,055,625.00	720,450.00
Telecommunication Function	143,400.00	10,687.50
Commercial Area Development Function	382,678,365.83	7,653,567.32
TOTAL	2,112,584,945.53	87,561,472.45

Considering three separate mega infrastructure projects including MRT project at an estimated cost of US$ 1.57 billion, airport train project at US$ 2.0 billion and MPDT project at US$ 1.6 billion, construction of PRASTI tunnel at US$ 2.2 billion is an effective way to overcome various problems in Jakarta and an innovative solution to obtain financial feasibility of the project.