

## **THE CONSTRUCTION OF SCIENCE AND TECHNOLOGY CULTURE ON THE DEVELOPMENT OF SURAMADU BRIDGE**

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**ABSTRACT :** The Construction of Suramadu Bridge is a technological product in view of people knowledge, which means that besides construction technology, its include the society development process. Learning from the previous bridge construction around the world, its also important to consider the human resources and societal adaptability to accept the bridge. The sociotechnology approach in this paper, gives a new perspective for develop Science and Technology Culture.

**Keywords :** indigenous knowledge, strata, main bridge, approach bridge

### **1. INTRODUCTION**

Suramadu Bridge is located in the northern part of East Java Province, Indonesia. With an overall length of 5.4 km, it spans Madura Straits and connects Surabaya and Madura Island. The bridge is composed of Causeway (40.25m + 35 x 40.5m) + Approach Bridge (40m + 7 x 80m + 72m) + Main Bridge (192 m + 434 m + 192 m) + Approach Bridge (72m + 7 x 80m + 40m) + Causeway (44 x 40.5m + 40.25m).

The bridge floor is transversely divided into motorcycle lane 3.05m + emergency stopping lane 2.25m + 2 x carriageway 3.50m + central reservation 2.00m + 2 x carriageway 3.50m + emergency stopping 2.25m + motorcycle lane 3.05m, the total width of bridge floor is 30m, with a transverse slope of 2%. (CCC, 2005)

The project consists of the main bridge and approach bridge, the main bridge is a twin-pylon, floating structure system, double-plane composite steel beam cable-stayed bridge which with the high bored pile cap foundation. The height of the main pylon is 140.62m, includingly, height of the upper tower column is 57m, height of the middle tower column is about 54m and height of the lower tower column is about 30m, three cross beams are designed along the columns. The pylon structure type is hollow-thin-wall structure. The superstructure is composite beam comprised of steel beam (consists of two steel box girders, cross beam and small longitudinal beam) and concrete deck slab. The cable is parallel stressing wire. The configuration shown in figure 1 and 2. (CCC, 2005)

This paper is to discuss comprehensively the integral aspect of technology in the development of Suramadu Bridge, with the socio-technology approach. By socio-technology is meant the establishment of signification in each process and technological outcome in connection with the increase of people's conduct, in individual or regional context.

The socio-technological point of view hypothesizes that people connected due to the development of the bridge are expected to obtain two advantages, namely the increase of people's knowledge system quality as shown in the form of consequence of the global knowledge system hegemony which is generally based on two doctrines : neutral and universal (Amir, 2002) and the utilization of the cultural Sci & Tech outcome itself for economic growth and people's conduct. The effort for increasing these is discussed in context of cultural Sci & Tech construction from Timothy Lenoir (Lenoir, 1977) who reveals a relation between dominant power (politic and economic) and knowledge system.

The construction of knowledge system can be started as an effort to legitimate one reality that group of people can accept where the knowledge system product is going to be placed.

To be specific. The Suramadu Bridge is knowledge system product, the group of people is people of East Java (especially people of Surabaya and Madura) in context of Indonesian people. Developing the Suramadu Bridge has become the right effort to build a knowledge system construction which, in turn, can be spread over to other regions throughout Indonesia, as to welcome the presence of relation between power and knowledge, especially the already developed knowledge and that which always evolves in society in the form of indigenous knowledge.

## **2. SCIENCE AND TECHNOLOGY CULTURE**

The Suramadu Bridge is technological product in view of people's knowledge in broader sense, thus the development authority is also expected to take reform measure on society (especially those connected) in order that relation between power and knowledge can take place properly. It means that problem existing in society, besides technology, also need social and humanity approach. In doing so, the role and function of Suramadu Bridge as generator to thrive the economic in East Java province, especially Madura Island, can be felt by the society.

The technological evolution's point of view has shown empiric data that the development of Suramadu bridge has met some evolutionary decision and designing processes since early 1990, during which a great deal of cultural Sci & Tech construction happened, either recorded or not. Such evolution will be identified for documentation to be used as a learning resource by whole elements of nation, coupled with the erection of bridge laboratory in Bareleng Zone (Batam, Rempang and Galang) between 1992 to 1998 with five types of bridge of all, also the Pasupati Bridge located in Bandung City which has been operated since June 2005.

Such learning resources are important when connected with the inclusion of Indonesian in the bridge technological evolution that exist in the world, starting from architectural aspect bridge type of Campo Volantin Foot Bridge, Bach de Roda Felipe II Bridge, Trinity Bridge, Alamillo Bridge (Kompas, 2005) Civil Engineering aspect (Fujiwara, 1991 and Nakai, 1998) or electrical and mechanical aspect, especially devices for earthquake damper for bridge construction, and other science disciplines dedicated to regional developments, geodetic technique to monitor the straight of a bridge while under construction and others.

It is also important that preparing of human resources in long bridge technology, at normative level, universities are considered to be agent that enable Indonesian people critical positive, creative-innovative and realistic-logic in meeting and acting towards various problems they face. While at strategic level, the national universities should be seen as the backbone agent of sustainable innovation for life and prosperity of Indonesian society-create and prepare skilful national cadres, sensitive towards changes and carry out their activities with best performance, source of science and agent of change in facing global challenges, social change and sustainable development. It's expected that a good understanding through the availability of the learning resources and the essence of cultural Sci & Tech construction will be able to formulate the preparing of capable human resources through strata and curriculum in universities, considering challenges in developing bridges and connecting facilities between island in Indonesia, have seemed to be sustained challenge and change due to its geographics and demographic conditions.

Furthermore, in this connection, it's expected that such strata and curriculum to be connected to the national policy on the need for design professionals (S-1), execution (D-3) and maintenance (S-1 & D-3) for bridges in order to meet the increasing needs of connecting facilities if relation between power and knowledge properly works. The designing of curriculum may not ignore indigenous knowledge so that the knowledge will be able to continuously spring and maintained and the technical capability aspects on geometry which is dimensional and esthetically valued in cultural and traditional development of the regions. In the future, bridge technology that will evolve has its root at the national culture - becomes a need.

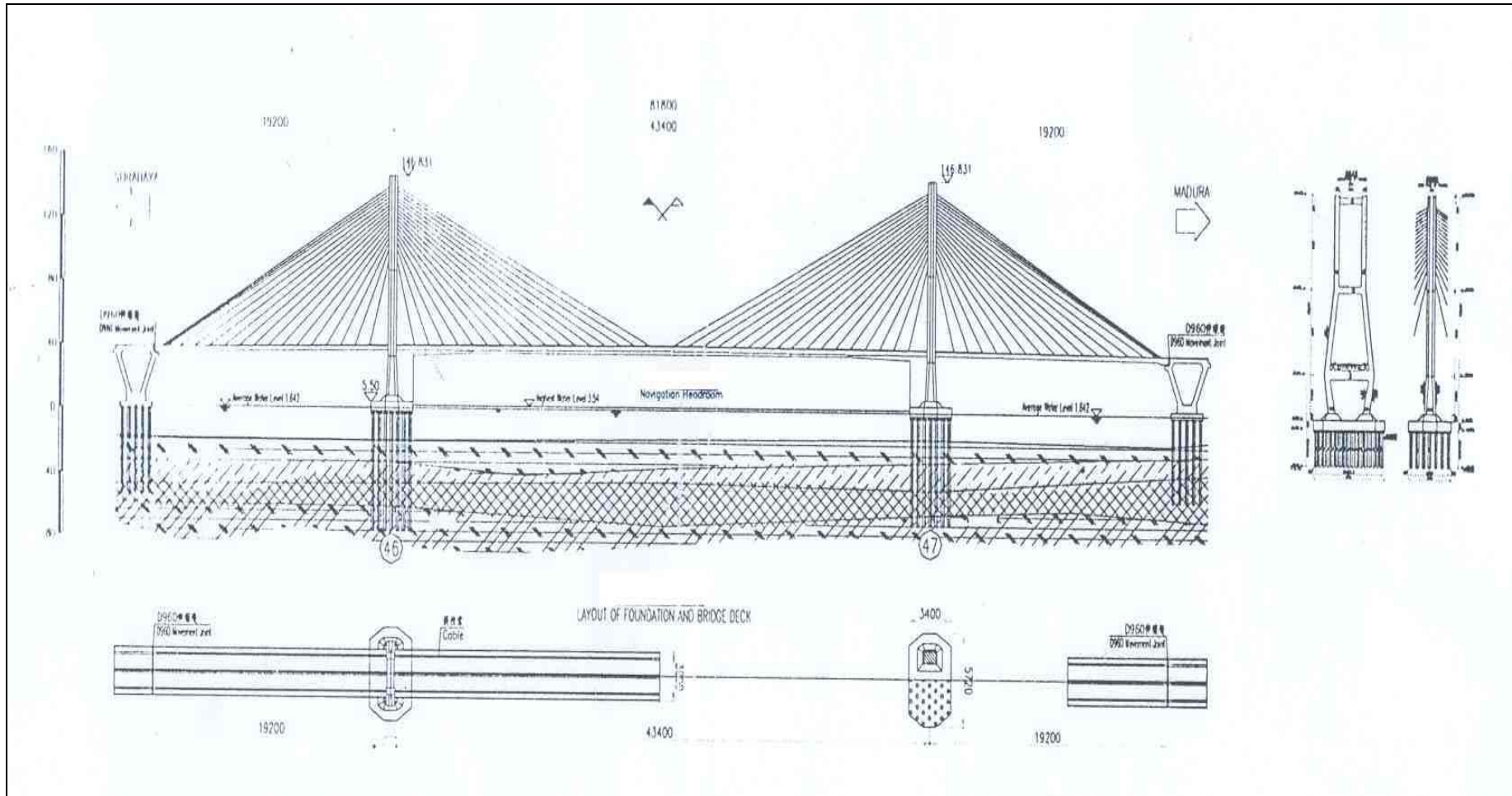


Figure 1 (CCC, 2005)



On the other hand, further challenge and chance are Sci & Tech-based industry aspects that likely follow to support, especially during execution and maintenance (service period for infrastructure at this moment is designed for a duration between 50 to 100 years). They are industries that directly support construction industry, in terms of, either material, devices, signage or maintenance tools so that it will be able to offer more employment at each stage of industry. When through observing the development of bridge technology, the non-corrosive light metal and high-performed concrete which likely expensive can be used longer and the standard improved with a mass production that will be able to decrease their production costs.

### **3. PROGRAMME FOR DEVELOPMENT OF SCIENCE AND & TECHNOLOGY CULTURE**

The programme is a series of operational effort according to systematic approach & everlasting in achieving justified-objective previously to build this Suramadu bridge. Thence conceptually this programme is a designated strategic public investment program based on government expenditure to affirm the relation between social knowledge & culture. Sci & Tech cultural mission in constructing Suramadu as a symbol of technological progress is to link-up the interest of life aspects & society livelihood. Therefore the activity programme is focused on:

- To reveal cultural construction of Suramadu's Sci & Tech to the people is in relation to understanding & acceptance to its role & function of bridge's Sci & Tech Culture. Its intention to raise better public life & livelihood of either national & East Java in general or especially Gerbangkertosusilo community & Madura.
- The state of society's self-control behaviour is tied in benefit from Sci & Tech Culture on one side & anticipation to ontological security to the other side.
- Sci & Tech Cultural power of the bridge symbolize technological advancement in relation to social-culture development system, notably for Madurese community.
- Enhancing economic activity growth of East Java populace, mainly Gerbangkertosusilo community-primary goal in building the bridge-which affect positively in national economic growth.

In general this programme is expected to affirm Suramadu constructing management in participation to expand the developing of East Java province. Especially Gerbangkertosusilo which has positive impact on steady national development. To support this, following programmes are decided to be taken;

- Suramadu bridge construction of Sci & Tech cultural communication programme; To consist course of action exposure principals & explanation of vision & mission to build the bridge to public who-are already advised during construction-expect to be completed in the year 2008.
- Suramadu bridge community motivation on Sci & Tech cultural encouragement programme; To consist principals to obtain syndication to manage & gain benefit in long-term.
- Suramadu bridge to support local wisdom in Sci & Tech cultural transformation programme; To consist principals of Gerbangkertosusilo & Madura's community social culture in appreciating the bridge construction.
- Suramadu bridge Sci & Tech cultural construction in IGA (Income Generating Activities) based on technopreneurship programme; To consist principals of policy & act in increasing locals' purchasing power through the Suramadu's benefit.

#### **4. CONCLUSIONS**

From the above series of programmes, have been concluded certain success indicators to offer four other suggestions in assisting to develop Sci & Tech cultures as follow:

- Understanding & acceptance level of the bridge construction from local life & livelihood aspects.
- Optimum space usage & environmental support including ecological preservation level
- Social development like social needs, ethic & risk level which may arise as side-effects following construction to the locals.
- Economic growth; impact on national & East Java province in respect to an equitable distribution of income.

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