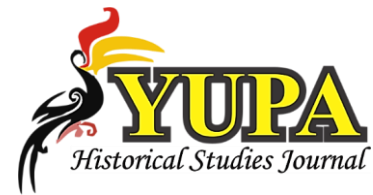


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Diversion of The Brantas River Flow to The Porong River

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Abstract As an archipelago country, maritime culture has been rooted in the history of Indonesian tradition. River utilization and control of the ocean have become the veins of the economy. Changes in the shape of the river will also affect what happens around it. The Brantas River, as one of the centers of culture and civilization in East Java, has extraordinary dynamics which has rapid flow and contain many streams. Further, the existence of the Brantas River has also become the economic lifeblood of the people of East Java. This research discusses changes to the Brantas river flow in the Porong branch. Changes in the Porong river branch occur due to natural factors and human modification. The result of the research show that modifications to the river flow carried out by the government at the time changed the direction of the river flow, the function of the river and the economic pattern of society in East Java.

Keywords: Brantas River, Porong River, Diversion Flow

Abstrak Sebagai negara kepulauan, budaya maritim telah berakar pada sejarah tradisi Indonesia. Pemanfaatan sungai dan penguasaan laut telah menjadi urat nadi perekonomian. Perubahan bentuk sungai juga akan mempengaruhi apa yang terjadi di sekitarnya. Sungai Brantas sebagai salah satu pusat kebudayaan dan peradaban di Jawa Timur memiliki dinamika yang luar biasa dikarenakan memiliki aliran deras dan banyak aliran, sehingga menjadi urat nadi perekonomian masyarakat Jawa Timur. Penelitian ini membahas tentang perubahan terhadap aliran Sungai Brantas di cabang Sungai Porong. Perubahan di cabang Sungai Porong terjadi akibat faktor alam dan modifikasi manusia. Hasil penelitian menunjukkan modifikasi terhadap aliran sungai yang dilakukan pemerintah pada saat itu mengubah arah aliran sungai, fungsi Sungai dan pola ekonomi Masyarakat Jawa Timur.

Kata kunci: Sungai Brantas River, Sungai Porong River, Perubahan Aliran



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INTRODUCTION

The Indonesian people are the great in maritime culture because this country surrounded by oceans and has a large river stream that ships can sail in trade. Strategic positions, the wealth of nature and the ability of navigation as means of transport and interaction have brought Indonesians capable of interacting with the nations of the world, thus enabling them to bring progress in civilization and culture and boost economy and prosperity.

History has recorded the glory of the nation of Indonesia with the establishment of rich and prosperous kingdoms through maritime culture and commerce both national and international. Commerce was established long before the beginning of the common era, as seafaring and commercial interaction in the early 4th century AD, a touch of influence in the history of the Indonesians also affected the culture and economy of both the Hindu Buddha, Islam and colonialism.

As the archipelago country, maritime culture had taken root in the history of Indonesian tradition. The harnessing of rivers and ocean mastery has become the lifeblood of the economy. Rivers as the center of civilization (Lapian, 2008, p. 1) that place the river's life in the subtlety and collective character of man. Lapian also describes the lives of many river communities as determined by the character of the bengals, as well as the means of communication between upstream and downstream. Before, there was a river overland route; it was the only place for the smooth transport of produce from the mountainous region to the estuary. The ruler of the estuary region is more profitable because it can master import exports from and out of regions (Lapian, 2008, p. 8).

The Brantas River is one part of the emergence of trading routes in the East Java region. The development of the Brantas River also had a major impact on the lives of the surrounding communities, especially in terms of the economy. Previous research on the Brantas River and its activities on it was carried out by Nastiti (2003), who focused on the role and activities of the Brantas river in the stem and upstream areas of the river, while Nugroho, A. S. (2020) highlighted economic activities in the Brantas delta in the estuary. All of this research focuses on ancient times when Hindu and Buddhist cultures dominated. Based on this research it clear that there was an explosion of trade in ancient times, which was concentrated along the Brantas river, involving various means of transportation such us boats and ships that could enter to upstream. Based on Inscription sources, it is revealed how economic behavior was formed, the commodities traded, and whom the economic actors were involved.

Research on the Brantas River was also carried out through underwater archeological studies by (Mochtar et al., 2021), who use side scan sonar. In this report research, various data on the Brantas River from the perspective of the maritime cultural landscape were revealed. However, there is still little research that sheds light on the characteristics of rivers and their

management, which caused changes in river flow patterns in the past and have an impact on changes in economic activity, just like the diversion of the Brantas River flow to the Porong River.

The river engineering history of the Brantas River recorded in ancient times is written in the Kamalagyan inscription regarding the construction of The Waringin Sapto Dam. And the next Brantas River engineering was in the colonial period reveal that there was human engineering of the flow of the Brantas River which occurred during the *cultuurstelsel* era in 1830 in the Kertosono area, and in 1920 at the Sidoarjo area, precisely on branch of the Brantas river which flow to the east, called Kali Porong. Engineering river flow was carried out by the Dutch colonial government to build irrigation for sugar cane plantations, which supplied the sugar factories spread along the Brantas River. Therefore, this research will discuss how the diversion of the Brantas river flow from ancient times to the colonial period, especially in the Porong River basin, and the various changes that accompanied it, and study the impact of river diversion and how the people adapted to face the change and continuity so that this will provide valuable learning for the world education about the existence of local wisdom.

METHOD

The method used in this research is the Historical research method which consists of Heuristics, Source Criticism, Interpretation and Historiography (Kuntowijoyo, 1995). Primary sources used are sources from the time when the event occurred, namely the site of a colonial-style house complex with numbers written in 1818 AD, houses in 1913 AD, 1915 AD and 1918 AD, and a pump house with numbers written in 1920. Photos of the Brantas River Delta Map in Valentijn (1708), Topographische Kaart Der Residentie Soerabaja, 1866, Map Kaart van Soerabaja en Omstreke- Isaac de Graaff, 1695; Map Kaart Van Soerabaja, 1925 in the Research Report of the Jogjakarta Archaeology Center 2021. Tertiary sources in the form of photos Map reconstruction of the results of research on river flow Brantas which comes from the Research report of the Jogjakarta Provincial Archaeology Center in 2021 and literature studies in various forms of scientific works in historical research.

Furthermore, the Criticism or Verification stage is carried out by checking the validity of the sources and the coherence of the sources with the research period to avoid anachronism. sources as well as the coherence of sources with the research period to avoid anachronisms, namely discrepancies in the placement of events with the time setting. The third stage is interpretation, based on the facts obtained, a line will be drawn that shows the red thread between the phenomenon and the event that occurred. The interpretation process is also carried out by looking at the results of interviews and adjusting to the context when the events occurred. At the historiography stage, the preparation of writing is a presentation of data and facts that

have been synthesized, interpreted, and presented in analytical and descriptive works. And then, it is presented chronologically so that readers can easily understand historical works.

RESULT AND DISCUSSION

Brantas River in Historical Perspective

Various epigraphic and historiographical studies have revealed the important role of rivers in Indonesia's maritime history. The pattern of cultural development around the river is divided into two (Hall, 1895), the first pattern is the river as a trade center where culture develops in the river delta area and the second pattern is the river as a support for the growth of agrarian society in fertile lowland areas. This pattern is seen around the Bengawan Solo and Brantas rivers in Java. In this second pattern, there is often trade activities to support the agrarian activities. Unlike the Bengawan Solo which has been inhabited by humans since the Prehistoric period, the culture in the Brantas delta region only grew intensively during the Hindu Buddhist period (Tim Penelitian, 2020).

The history of the Brantas began to appear in Javanese history in 1052 AD during the division of Airlangga's kingdom by Mpu Barada to avoid civil war between the prince (Tim Penelitian, 2020). The second time history of the Brantas appear about the construction of the Waringin Sapta dam as outlined in the Kamalagyan inscription in the 11th century AD to avoid flood. The construction dam made the river into a three-branched river for the purpose of flood control. And this effort has yielded positive results because flooding can be overcome so that the community can pass through the inter-regional river route between upstream and downstream areas by bringing various kinds of commodities that can be traded. The Kamalagyan inscription is a record of the Brantas River which shortly afterward deltaed the Brantas River. River delta was divided by King Airlangga into two kingdoms, namely Jenggala and Panjalu to avoid civil war.

The dynamics of the Brantas river are then described in the Canggu inscription which mentions the village of crossing along the Brantas river and at this time. Based on the Canggu inscription, the Brantas delta region was no longer divided into two but grow more to the east which had already new empire Majapahit region which grew in the 14th century AD. The contents of the Canggu inscription indicate the bustling trade activities along the river route so that it was deemed necessary to regulate tax collection (Tim Penelitian, 2020).

The Brantas River, which is the economic lifeblood of the people of East Java, has two maritime cultural landscapes, namely the Hindu-Buddhist period covering the period from the 11th century AD to the 14th century AD and the Dutch East Indies cultural landscape covering the 19th century AD to the 20th century AD.

During that time, the Brantas river experienced various change. (Tim Penelitian, 2020) revealed that there were very intensive changes in the landscape of the area around the Porong

river. Analysis of several old maps, public information and location survey shows changes in the regional landscape, that there is an increase in the land area further to the east due to very long process of sedimentation and also due to the flow of Lapindo mud at the estuary of the porong river.



Figure 1. Map change of Coastline shifts from 1871 to the present
(Archaeology Center Jogjakarta 10th December 2020)

Apart from the widening of the area due to sedimentation along the coast, there was a shift in the river flow path where indication of the old flow path were found on the north side of Porong river, which was a trade support network that passed through Tulangan and Pamotan eventually becoming land due to by massive sedimentation.

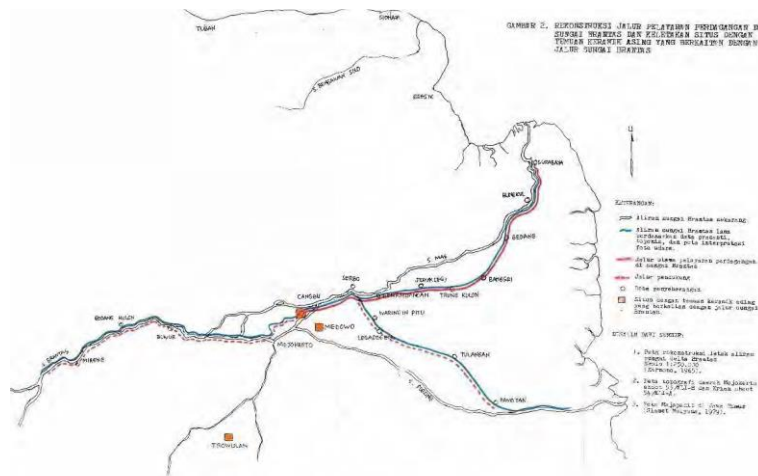


Figure 2. Map of reconstruction of the Brantas river shipping route according to Haryadi (1998)

Based on the map above, there are shipping route that leads south from the main route in Canggü to Surabaya. This southern route is support rout that passes through Tulangan and merges with the porong River in the Pamotan area. However currently there are no large rivers in this area, so the river flow used as a shipping route in Tulangan and Pamotan has disappeared and turned into agricultural land. The Existence of this supporting pathway is recorded in the Canggü Inscription in Callenfels & Vuurens research (1924. P67-81)

Changes of river flow paths mostly accrue due to the sedimentation process. An increase in the rate of erosion which takes place continuously during the rainy season and causes the loss of top soil which is then carried away by river flows and so on causing sedimentation in rivers or reservoirs (Erlina, 2018).

Sedimentation in the Brantas River area occurs as a result of:

1. Eruption of Mount Kelud and Mount Semeru in the upper reaches of the Brantas River;
2. Land erosion in the upstream area of the Brantas River; and
3. Landslide on river cliffs and tributaries of the Brantas River

How the Eruption of Mount Kelud influenced the area is explained through a picture by Callenfels.

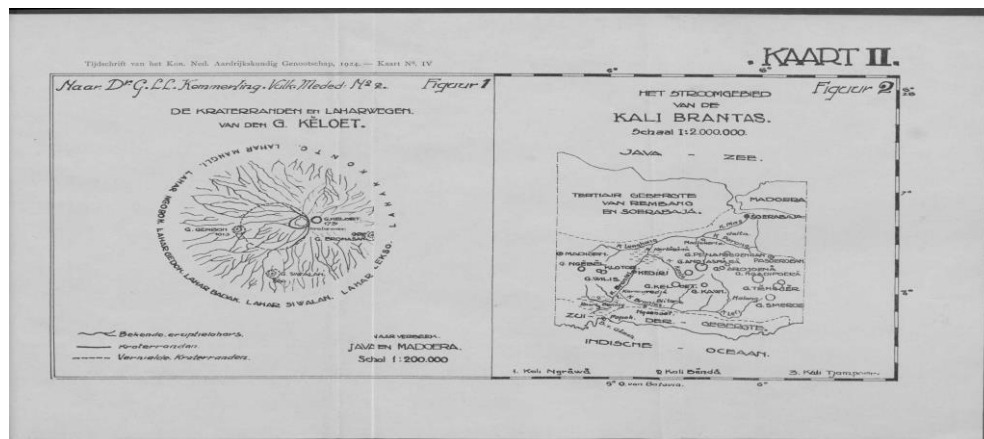


Figure 3. Mount Kelud lava flow casing sedimentation in the Brantas River

Source: CONTRIBUTION TO THE TOPOGRAPHY OF THE SURABAYA RESIDENCE IN THE 14TH CENTURY BY MEANS OF P.V VAN STEIN CALLENFELS AND L. VA NUUREN [with cards Nos.III,IV,V]L] Publish in Geographical Society Magazine, 1924-01-01

Based on Figure 3, we know this sedimentation is what accelerates change in river flow paths in the past, which occurred due to natural factors. In contrast, during the colonial period, changes in the river flow routes were Influenced by human modification in order to build irrigation systems for plantations.

Brantas River Flow Diversion

Around 1832 there was a diversion of the Brantas river flow in the Kediri area (as part of Mancanegara Wetan). The transfer of the Brantas river flow from the west to the east of Kertosono can be traced from oral sources / overlevering (stories from mouth to mouth in society) that made the Brantas river is Mpu Barada by pouring water from the kettle became a river. The flow of water divide region to be two kingdom, namely Jenggala and Panjalau (kediri). Furthermore, the story continues at islam period when Sunan Bonang who received unpleasant treatment from the local people because of his anger moved the flow of the river by closing the

flow with a singkal (Plow Head) and outlined Cis-belian towards Kertasana and cursed all teenagers to become virgins and spinsters (Kasdi, 2008, p. 40).

The proof of oral story was carried out by Aminudin Kasdi by comparing the documents of the VOC expedition report to Kediri 1678 and the ecological approach through the writings of Purbawijaya. The story of the river diversion is contained in the manuscript *De Geschied van Het Rijk Kediri* collected in 1832 by Purbawijaya, at the beginning of the Dutch East Indies government in charge of Kediri, and the manuscript was recorded in 1873 by Mas Soemasentika and then translated by P.W. Palmer van De Broek, an official of the controller of internal and foreign affairs in Java-Madura (Kasdi, 2008, p. 40).

When forced cultivation was to take place in Kediri, officials were mobilized to collect territorial data for this purpose. One of these officials was Kiai Purbawijaya, originally from Kediri. Some information was also received from a community group personified as Butalotjaya. In the interests of forced cultivation, the Brantas River was tamed by managing its flow, closing off tributaries by creating tanks to improve its flow. One of these was to close the stream west of Kertasana. The government then replaced it with an organized irrigation system. The creation of the tanks took many years and even generations so that when *De Geschied* was booked (1873) the river was finished, the remaining troughs could still be observed (Kasdi, 2008, p. 40).

Based on the remaining troughs and swamps, the stream used to flow to the west of Kertasana from Singkal village, Demangan, Ujung and united at Widas. When looking at the condition now there are troughs and swamps but the river flow changes from Singkal-Warujayeng- Demangan, Ngujung- lengkong which can be observed geographically.

Furthermore, the transfer formed various versions of the legend, including the Butalotjaya version, which felt disadvantaged due to the transfer of the river flow which caused the western Kertosono area to become dry and unirrigated.

The third transfer of the Brantas River flow occurred in 1920. Still in order to irrigate plantations, but at this time there was an ethical political policy, namely the irrigation sector. However, the starting point for the management of the Brantas River flow gradually took place from the forced planting until the implementation of ethical politics. The process lasted

Several generations through the construction of reservoirs, dams, stalks / sluice gates, Irrigation canals for sugar cane plantations to fulfill the raw materials for the sugar factory industry and the need for high-discharge water to drive machinery. Water needs with high discharge to drive steam engines in the Sugar Industry. At the peak of the sugar factory reached 13 factories (Tim Penelitian, 2020).

This development has actually caused the cessation of shipping from upstream to downstream of the Brantas river because of the existence of this sluice gate so that it cannot be crossed by ships and boats. Shipping still occurs but on a small scale. The construction of the Post

Road by Daendels has accelerated the transfer of trade mobilization which initially used river traffic to the highway. The construction of bridges is also one of the causes of the reduction of maritime activities in East Java. The construction of dams / floodgates gradually continues to split the Brantas river flow into two. The manipulation of the Brantas river flow carried out by the Dutch East Indies government by activating artificial branching of the Brantas River.

Archaeological remains that are still clearly visible are the branching structure of the Brantas river on the border of Mojokerto district and Sidoarjo Regency in the Mlirip area. The Dutch East Indies government built the Lengkong dam and divided some of the eastward flow into irrigation canals. The construction of this dam cut off traffic on the Brantas River. The Brantas flow split into two towards the north empties into Surabaya, known as the Mas River and towards the east becomes the Porong River (Tim Penelitian, 2020).



Figure 4. Aerial view of the Brantas (river) near Lengkong by Naval Aviation Service Dutch Indie 1947
Source : KITLV MLD62_016



Figure 5. Aerial view of the Brantas (river) near Lengkong which full fill by sedimentation by
Archaeology Center Jogjakarta 2020

Based on the old map by Callenfels (1924) show that in 14th Century Brantas river branch in porong flow to the south and it appears that the flow of the Porong River leads south towards Pasuruan. Other Old map by Valentijn (1708) show the direction of Porong river leads south toward to the dry river today this refers to the toponymy of Trompo Asri and kali anyar, which is close to the current village of Kedung Cangkring village. This river stopped flowing and became a dead river after the construction of the Sluice Gate at Pejarakan and its regulator at the Pump House in 1920 closed the flow of the river through Kedung Cangkring village. The river through Kedung Cangkring village to the south became death river but its built canal for irrigation to the south.



Figure 6. Map Of the Brantas river flow in the 15th century according to Callenfels (1924)



Figure 7. Map of Brantas delta region in Valentijn 1708

The aim of modifying the river flow is to prevent flood in Pasuruan region which is potential area for sugar cane plantation. But unfortunately this has killed trade along Kalianyar Port and people economic which depend on trading and batik production. The other impact of straightening the Porong River is the increasingly rapid current. Usually people cross the river using mining boats. However, the strong current means they need to adapt, so the mining boat has to cross diagonally to avoid being swept away by the current.

Regarding when the diversion began, based on the writing on the pump house in Pejarakan village, it can be seen that the pump house was built in 1920. However, a study of the ancient Topographische Bureau 1892 map included a straightening of the river flow. This form of the straightening can be seen in the Brantas Porong river in Gambiran Village, the Porong Cannal in Pedjarakan village, and the muara kali Mas. On the 1866 Topographische Kaart der residentie Soerabaja Map, the straightening of Brantas River in Gambiran Village is not yet depicted, and it is possible that the river straightening was only carried out between 1866-1892.

This is reinforced by the existence of colonial style houses in the village Kedung Cangkring where the oldest is dated 1818, followed by other houses spanning almost a hundred years along with the construction of the pump house which was built in 1920. The houses' dates are 1913 AD, 1915 AD, 1917 AD and 1918 AD.



Figure 8. Year Number of Pump House In pejarakan Village
(Ratih's personal documents, March 2021)

The closure of the Pejarakan sluice and the drying up of the river to the south led to the Kalimati or dead river. The death of this river has stopped and cut off the trade routes and activities in the estuary which were very busy. The shift in the flow of the Porong River gradually had an impact on the shift in activities that led to the decline in batik production and trade as the main commodity of Kedung Cangkring Village. From this study we know that changes in the landscape can occur naturally due to natural activities such as volcanic activity and hydrological activity. Change can also occur as a result of human activities that modify the natural landscape, the direction of river flows and natural product to greatest extent of human prosperity. However, a modification will have both positive and negative impacts, but the most important thing is that our society is able to adapt to various change so that it can still survive. This adaptability shows the existence of local genius which should be a lesson for the nation's future generation.

CONCLUSION

The Brantas River is one part of the emergence of trading cities in east Java region. The development of the Brantas River also had a major impact on the lives of the surrounding communities, especially in terms of the economy. This is due to the diversion of the Brantas river flow to the Porong river. Archaeological remains that are still clearly visible are the branching structure of the Brantas river on the border of Mojokerto district and Sidoarjo Regency in the Mlirip area. The Dutch East Indies government built the Lengkong dam and divided some of the eastward flow into irrigation canals. The construction of this dam cut off traffic on the Brantas River and made many modifications in the Porong River that change the landscape of the Brantas Delta region, which has positive and negative impacts. So that it can be lesson study for us to improve our ability to adapted about the change using our local wisdom. Therefore, studies about diversion in brantas river is very usefull for our educational world.

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