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**The confluence of water and power: water management in the Brantas river basin from the tenth to the sixteenth century CE**  
Prasodjo, T.

**Citation**

Prasodjo, T. (2022, January 27). *The confluence of water and power: water management in the Brantas river basin from the tenth to the sixteenth century CE*. Retrieved from <https://hdl.handle.net/1887/3254360>

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# Conclusion

This thesis explores the relationship between state power and water-management in medieval East Java. More specifically, it studies the balance between the state and local communities in the creation and management of waterworks in the Brantas river basin during the tenth to sixteenth century CE. In a long-term comparative perspective, taking into account the experience of other Southeast Asian states, the thesis builds on archaeological and epigraphical evidence to demonstrate that East Javanese water management was primarily driven by local communities. In other words, it was the East Javanese village (*wanua* and *watĕk*) that built waterworks to control and manage the local demand and supply of water. In my thesis, a village-scale territory refers to an administrative division of the East Javanese kingdom which included a clustered human settlement, as well as the land, the rivers, the valleys and the hills that were part of it. Administratively, villages (*wanuas*) were under direct jurisdiction of a *watĕk* (a group of villages) and *watĕks* were incorporated into the kingdom. Together they formed a three-tier system of government: court-*watĕk*-*wanua*. A *rakai* or *rakryan* was the head of a *watĕk*, while a *wanua* was governed by a group of *rama* (elders) and several village officials. I use *wanua* and *watĕk* as generic terms to refer to a village and a group of villages. Although the term *wanua* changed to other terms, such as *thāni*, *karaman*, and *desa*, between the ninth to fourteenth century, the nature of its administrative structure remained the same.

Archaeological remains in East Java provide information on various types of

water works in both the upland and the lowland areas, including dams, ponds, weirs, canals, underground tunnels, and wells. Remains of dams can be traced in an area between the Anjasmoro-Welirang ranges and the Brantas river, such as the Baureno and Kunitir dams. Apart from a few large water reservoirs, there are numerous smaller reservoirs, ponds and wells, as well as smaller devices, such as the clay pipes and waterspout artefacts exhibited in Museum Majapahit at Trowulan. Remains of canals and underground tunnels are found in particular in and around Trowulan and Kediri. Most of this hardware was used to collect water for irrigating agricultural land, primarily at the micro level of the village community.

The epigraphical evidence confirms that the East Javanese water works were built and managed on a small scale by the local communities at a village (*wanua*) level. The East Javanese inscriptions provide information on water officials who worked in managing water, such as *air haji*, *lěblěb*, *hulair*, *hulu wuattan*, *mawuai*, *manambani*, *jukuñ*, and *matamwak*. From these eight officials there were only two, the *air haji* and *lěblěb*, who are known to have served the royal court as water tax collectors. All others worked for the local community, as they are mentioned in inscriptions together with village (*wanua*) officials. What is more, these officials figure much more prominently in the East Javanese inscriptions than the court officials. Hence, the local officials appear to be the prime agents in constructing and maintaining the water infrastructure implying a decentralizing tendency leading to more self-management by villagers.

If we compare the decentralized case of East Java with other water management regimes in Southeast Asia some remarkable differences emerge. First of all, much more top-down initiative was coming from the central court in the ancient Burmese and Thai polities, although there too, implementation was in the hands of local officials. Zooming in on the Chao Phraya river basin, this is true for at least the Chiangmai, Sukhothai, and the Lanna eras. Interestingly, however, it is in the later Ayutthaya period, that the central state was losing its hold on the water management, giving more agency to local farmers, be they individuals or farmers organized in groups. The socio-political differences between mainland Southeast Asia and East Java require further study, but it seems that basic geographical and climatological differences played a crucial role in making the water management regimes in mainland Southeast Asia more top-down than in East Java.

The differences between the physical environment of mainland Southeast Asia and that of East Java are mainly twofold. The first difference concerns their rivers, as the rivers of mainland Southeast Asia are very long and flow from north to south, forming large, extended basins, while in East Java a narrower basin is shaped by a smaller river. The Brantas river basin has an area of only 11,800 km<sup>2</sup>, which is much smaller than that of the Irrawaddy, for instance, which has an area of 413,700 km<sup>2</sup>. The second feature is the existence of volcanoes in East Java, which are missing in the landscape of Burma, Thailand, and Cambodia. The volcanoes of the Brantas river

basin are situated in its inner region, where the basin is bordered by the river's course, which forms, approximately, three-quarters of a circle. There are at least five volcanoes in the basin: Penanggungan, Welirang, Arjuna, Kawi, and Kelud. These two features led to different ways of managing water in mainland Southeast Asia and East Java. Because of the very short distance between the river and the mountain slopes, the plains of the Brantas river basin's valleys are narrow, meaning agriculture is limited, while some of them are floodplains. Therefore, agricultural land was expanded to the alluvial fans and mountainsides. In order to cultivate these areas, a specific water management process was needed, one that would ensure easy access to water through the construction of related infrastructure, such as canals and dams, to hold water and prevent it from flowing down the steep river.

How important geography and climate can be, has been demonstrated in this thesis by providing a new explanation for the eastward shift of the Javanese political centre during the so-called Medieval Climate Anomaly in 900-1300 CE. Although there is still much uncertainty about its precise repercussions for the Indonesian Archipelago, it seems that Central Java was struck by a fatal combination of a volcanic eruption with excessive rainfall, lava and water producing flows of mud (*lahar*) that destroyed the area surrounding the Merapi. In the longer run, the political shift to East Java may have been facilitated by higher-than-average rainfall levels for Java during this period. This study suggests that this same Medieval Climate Anomaly provided a more favourable climate for East Java, with higher-than-average rainfall levels in this relatively dry part of Java, which may have been one of the main reasons for consolidating the eastward shift. However, at present all this remains mere speculation, as climatic change in this region of the world is under ongoing investigation.

The evidence for local agency of East Javanese water management adduced in this study, contradicts earlier findings of J.G. de Casparis, who observed increasingly centralizing tendencies within the state between the tenth to fifteenth century. It also complicates the idea of a linear trajectory of ever-increasing centralization of Southeast Asian states as suggested by world-historians like Victor Lieberman. Van Naerssen and Boechari, both also dealing with the role of the state, proposed a two-layered structure consisting of the king (the *rakai* who could unify other *rakais* into the kingdom, after which he called himself *mahārāja*) and a group of local rulers (*rakais* or *rakryans* of several villages or *watĕk*). The relationship between these two levels was interdependent, but politically speaking, the local rulers were autonomous. Jan Wisseman Christie refined this structure by adding another layer, thus arriving at the three levels of *kraton*—*watĕk*—*wanua*, or court—group of villages—village. This study does support Jan Wisseman Christie's conclusion that the horizontal connections at the *wanua* level were much closer than the vertical connections between the *kraton* and the *watĕks*. Because several villages (*wanuas*) were bonded together in a *watĕk* (group of villages), it was easy for the members of

the *watĕk* to create networks and make horizontal connections.

Overall, the results of this thesis support the layered interpretation of Wisseman Christie. Figure 6.1. shows the relationship between the court and the villages. It highlights the self-organizing principles of the local communities as represented by local officials. The majority of water management activities, which are planning, constructing, maintaining, and securing infrastructure, were managed by local communities and local rulers.

Records from the Seloliman inscription of 1358 CE and the Kaputran inscription of 1355 CE give explicit examples of water tunnel constructions that were initiated by villagers; in these cases they are named Tiga Kaki and Ki Pupuh Hālah Papan. Above all, responsibility for managing, maintaining, and securing it were all the responsibility of local officials. Most of these officials, such as the *hulair/hulu bañu*, *hulu wuatan*, *mananbani*, *matamwak*, and *jukuñ*, worked for a local ruler such as a *rakryan* and so had the authority to control and regulate water resources and infrastructure. Moreover, security measures surrounding the water infrastructure were in the hands of people who lived near that infrastructure, and the court demanded the participation of the local community in developing precautions and safeguards to protect the construction from being destroyed by natural disasters or human action. This is seen in the Kamalagyan inscription of 1037 CE, in which the safeguarding of the dam and dyke was in the hands of the nearby community. The village water enterprise also created a network of water users between neighbouring villages. Most likely, the water network came into existence when water users from different villages used the same water source, such as a dam or a canal.

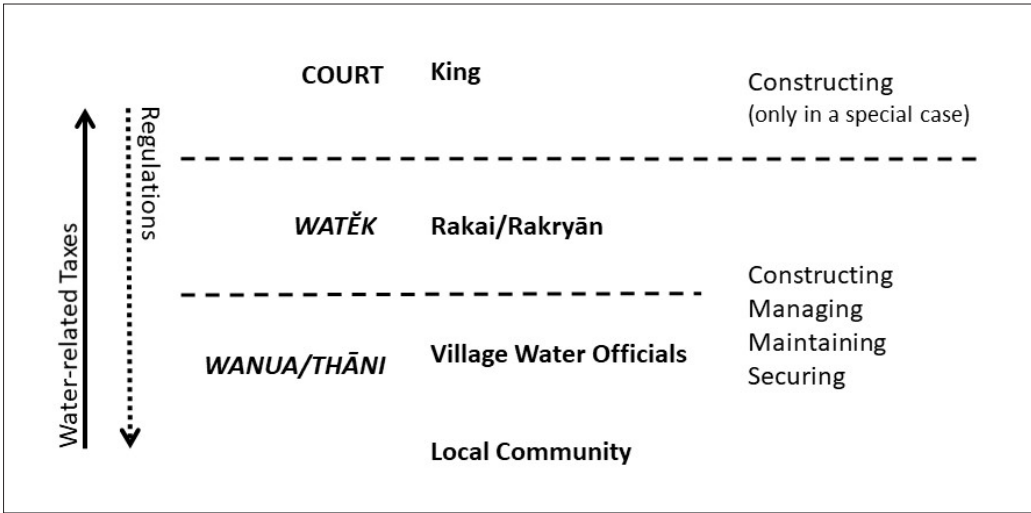


Fig. 6.1. Water management bureaucracy of East Javanese states. (Schema by Tjahjono Prasodjo)

The only exception was when the East Javanese court intervened in the restoration of a dike, a flood-preventing embankment, on the bank of the Brantas river, as reported in the Kamalagyan inscription. The reason behind this intervention was not only to prevent and protect people's land from flooding but also, and primarily, to secure the state from any economic decline resulting from crop failure and the disruption of river trading traffic. Thus, the intervention was motivated by fear of deprived revenue from transportation and crop taxes which might cause a shortage of liquidity.

More direct state intervention can also be observed at the level of water transportation. Epigraphical evidence strongly suggests a Majapahit state that tries to regulate the logistics of water transportation. Figure 6.2 maps the East Javanese transportation network, showing a hierarchy of port types along the Brantas river. Port A is located at the mouth of the river, near the sea, and functioned as an entrepôt for overseas trade. According to the Caṅgu inscription (1358 CE) from the Majapahit period, this port is Śurabhaya. Port B is situated near the capital and served as a gateway through which traders visited the capital in order to do business. It can be ascertained that this port was located in Caṅgu, an important port in the Majapahit era. The capital of the Majapahit Kingdom was located further upstream in Trowulan, at a point that is at the closest interface between irrigated fields and riverine transport. Port C sat on a confluence between the main river

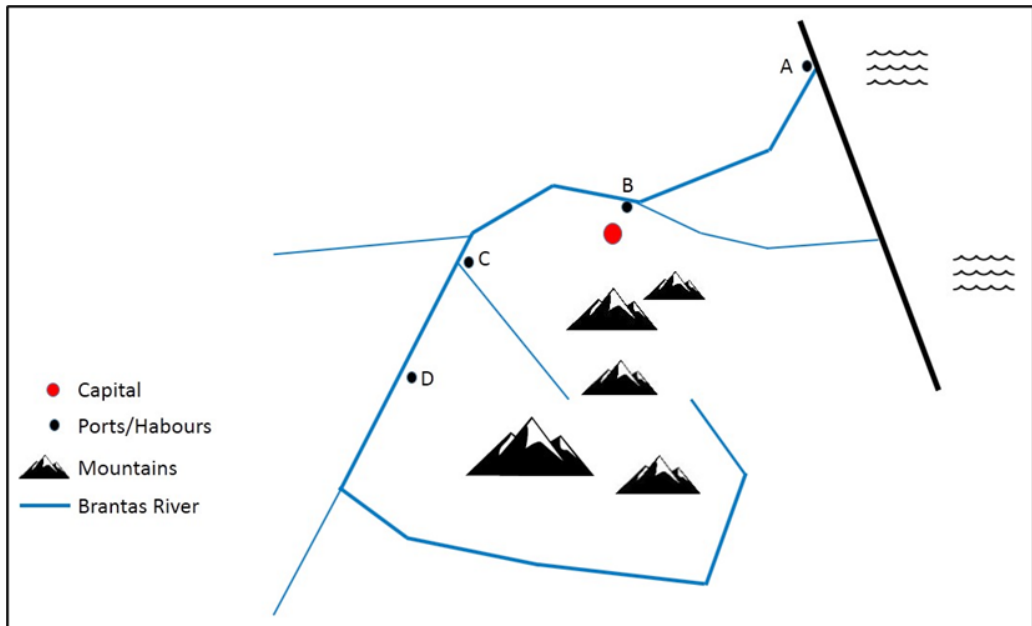


Fig. 6.2. The network of connectivity between capital and river ports in the Majapahit era. (Map by Tjahjono Prasodjo)

and one of its tributaries and served as a meeting place for river- and hinterland traders who used the tributaries to transport their goods. One of the ports which is mentioned in the Caṅgu inscription is Mabuwur. Similar to port C, port D was also a port that was a meeting point, but one to which hinterland traders transported their goods overland. Ports, such as Mireñ and Pagdañan, acted as D types of ports in Majapahit era. Rice and other natural products reached these ports from areas across the river basin and, especially, the fertile regions, such as the floodplains and slopes of the Penanggungan, Arjuna, Welirang, and Kelud mountains.

Although we have stressed that East Javanese polities, including Majapahit, should be perceived as a decentralized realm consisting of dispersed *watěks*, we also witness a state that was perfectly able to control its realm by leaving the practical water management at the level of the *watěks* and *wanuas*. A more remote control was exercised by taking control at certain riverine choke points at the very interface of the kingdom's settled and mobile resources. This kind of indirect control through taxation and regulation was facilitated by the increasing importance of maritime trade which created more sources of more liquid income for the state. Overall, at least from the point of view of water management, this thesis strongly suggests that the kings of Majapahit and other East Javanese kingdoms were in a position to rule a decentralized polity. Compared to the states of mainland Southeast Asia, the East Javanese polity makes a much more decentralized impression in which the state, by regulating the riverine transport system, merely oversees a political economy that was driven by the bottom-up initiative of local communities.