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Nail of the World: Mandalas and Axes

Did "traditional" non-Western cities evolve as ceremonial or economic centers? Mandala concepts were influential in central Java, but not in East Java, where the fourteenth-century capital Trowulan may have been designed as an axis mundi.

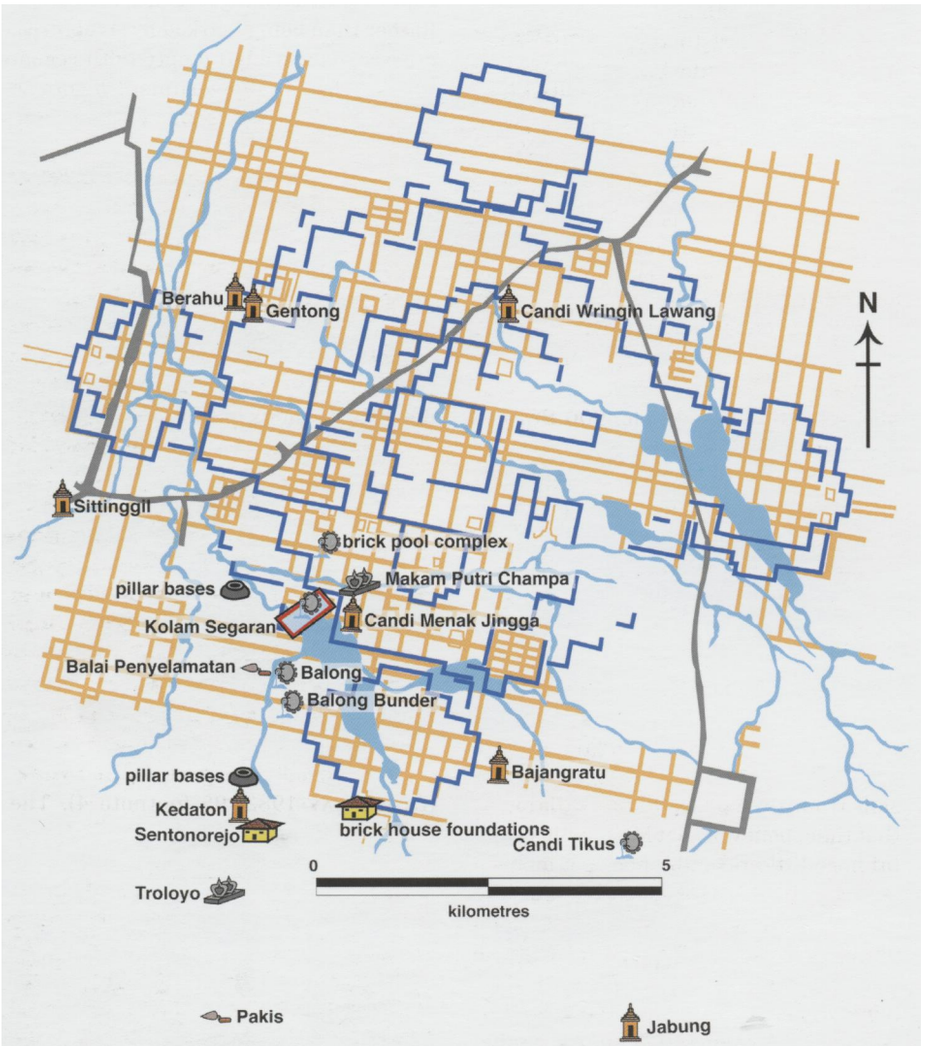


Fig. 1: *Maclaine Pont's 1926 reconstruction of Majapahit's capital as a mandala.*

The village of Trowulan (anciently called Antarasasi) lies 55 km Southwest of Surabaya, East Java. Raden Wijaya, founder of Majapahit, established his capital at Trik, now Tarik, 20 km to the East. He probably moved to Trowulan in 1294.

We have no direct information concerning the principles according to which premodern settlements in Indonesia were laid out, neither from history nor from archaeology; thus we cannot determine whether Trowulan evolved from earlier patterns or whether it constituted a radical departure from an older pattern. The plan of Trowulan itself is still poorly known, but it is the oldest city in Indonesia where it is possible to attempt to reconstruct its spatial organization. Ir. H. Maclaine Pont, who was in charge of the sugar plantation which occupied much of Trowulan in the 1920s, explored the site and published some conclusions, unfortunately without much supporting data. His work nevertheless must be taken into account, because he had extensive local experience. He composed an elaborate reconstruction of Trowulan based on the concept of the mandala (MACLAINE PONT 1926) **(fig. 1)**. We do not know the extent to which this theory is based on a pre-existing assumption, how much on imagination, and how much on observation. According to oral traditions collected from villagers in the 1980s, who would have been very young in the 1920s, he exposed buried ruins with high-pressure water hoses; the villagers took advantage of the opportunity to carry off the bricks.

Mandala concepts were influential in central Java's sacred places such as Loro Jonggrang and Candi Sewu, but no temple complexes in East Java appear to have been designed according to the mandala model. The word mandala was used often in East Javanese inscriptions, but in references to religious communities rather than to ground plans or other architectural features.

Although the mandala (defined as a symmetrical pattern of circles enclosed in a square) does not seem to have been influential in the organization of space in East Java, there is evidence that Trowulan did not develop at random; the remains of the fourteenth-century city are much diminished and no doubt distorted by recent looting of building materials, but they appear to display a pattern indicative of a predetermined layout. To the best of our knowledge, Trowulan was not enclosed by a wall. Residential compounds of the elite may have been surrounded by walls, but we have no evidence that this or any other Indonesian cities had walls until the Islamic period. Archaeological data may be biased by the destruction of huge portions of the site of Trowulan, but available information does not support Maclaine Pont's vision of a huge urban mandala. Pigeaud (1960-63: IV, 12) found that his town plans "do not carry conviction, [but] his idea that the town covered a considerable area of land no doubt is right." If the mandala was not the concept underlying Trowulan's plan, then what was?

Paul Wheatley (1971) argued that "traditional" non-Western cities evolved as ceremonial rather than economic centers. If this assumption were true, then religious rather than economic factors would have been the critical variables determining urban groundplans. He argued that the origins of Southeast Asian cities lay outside the region: in China for North Vietnam, in India for the rest of the region (Wheatley 1983).

One way to visualize the problem is to imagine a spectrum of urban settlement patterns, in which one pole consists of cities with groundplans completely dictated by religious concepts, while at the other pole is a settlement pattern determined solely by economic factors. In reality, most settlements whether ancient or modern probably lie somewhere between these two extremes, with each example defined by a greater emphasis on either praxis or idealism.

According to the *Arthasastra*, the ideal city should be laid out as a grid, in which each square is allocated to a specific occupational or status group. Brahmins should live in the North, Kshatriyas in the East, Vaishyas in the South, and Sudras in the West. The palace should stand in the center.

One archaeological correlate for such a pattern would be a segregated distribution of occupational specialization. A study of Anuradhapura, Sri Lanka, found archaeological evidence that craft activities, from the Iron Age (c. 900 BCE) to the eleventh century CE, were evenly distributed in the site. Anaradhapura's layout incorporates some cosmological imagery, but such imagery was only one of a number of contesting "texts" present within the urban form. Even at that period, as we have seen with the case of Anuradhapura, economic dynamics are clearly visible within the "artefactual" record, forming a "contestational" reading' (Coningham 2000: 354).

Christie (1992), deriving her conclusion from the sparse data available at that time, believed that Majapahit's capital bore little resemblance to a modern city. Evers (1984: 146) concluded that "the early Indonesian or Javanese capitals do not seem to have matched an urban image... The spatial perception is centrifocal, and the centre is the kraton or istana of the ruler rather than a capital city." Javanese literature, the source of these generalizations, focuses on political and religious aspects of capitals, with some information about the economy. Residential areas, whether large or small, dense or dispersed, are ignored.

Trowulan, the Axis of the World, and the Four Quarters

Two basic principles found in Indonesian cosmological thought are the *axis mundi* and the four-fold division of the world. In Balinese cosmology, the Southwest and Northeast quarters are auspicious, while the intersection of the North-South and East-West axes is a site of powerful and dangerous unseen forces. Rather than being marked by structures, crossroads were left empty until recent times, when the government began to erect large statues in them, interfering with processions.

The search for an underlying set of principles which might have been used by the planners of Trowulan in the late thirteenth and early fourteenth centuries must cover a range of possibilities:

1. A mandala focused on mythical mountain symbolizing Mt. Sumeru. The central mountain represents the realm of the gods; humans live in an outer ocean. Such a principle may have been used for specific parts of Trowulan. The *bale kambang* or floating pavilion remains a popular element in architectural design in Java and Bali today. The large water reservoir called *Segaran* near the center of Trowulan once had an artificial island in its midst **(fig. 2)**; M. Jacques Dumarçay of the École française d'Extrême-Orient records that traces of an artificial island once were found in the reservoir, but were removed during renovation work. (Dumarçay 1982: 95 footnote 4). The

Fig. 2: *Segaran*.

Fig. 3: *Gateway on West Mebon.*

West Mebon in Angkor may have had a dual symbolism: on the east side of an island in the reservoir once stood a temple, potential remains of which are as yet unexcavated, possibly representing Mt. Meru, while on the West side of the island was an enormous statue of Vishnu representing the creation of the universe **(fig. 3)**.

The simplest mandala is a quincunx, with a central peak surrounded by four secondary peaks. This pattern of five points was much favoured by Khmer architects for their temple mountains at Angkor. On the other hand, the pattern of 4+1 also had and still has an economic significance in Java. The five-day market week is still important in Javanese life. Now it is mainly used as a means of predicting whether a particular day is auspicious for a certain activity, but until recently it was also the organizing principle for daily markets. It is still common to find places with names such as Pasar Kliwon, the market held on the day Kliwon of the five-day week, in Java. Thus the pattern of 4+1, termed *macapat* in Java, could equally have had spiritual and economic significance.

2. A round or square outline. Both principles are closely associated with the origin of cities in some parts of the world from forts. Although most forts in historic times have been square or rectilinear, early forts in the Near East for example were round. This is logical according to the principle that the geometric shape with the shortest perimeter is a circle; thus the fort wall requiring the least amount of material is a circular wall.

3. The grid. In addition to the *Arthasastra*'s stipulation of this pattern as the ideal, based on a hierarchical division of society into many compartments, each of which should remain isolated from others, conducting all important activities such as eating and marrying within its own confines, one can find many other contexts in which the grid pattern emerges as a result of various factors. In gardens, which have served many cultures as metaphors for ideal harmony, the grid pattern has been commonly employed. From the garden of the Taj Mahal to the Taman Sari in Yogyakarta, one can find gardens laid out according to a rigid plan based on the constructions of avenues flanked by compounds. The common element linking grids as social demarcations to grids as metaphors for natural harmony is that in each case the grid creates a large number of closed areas. In the case of Java, one factor which favors the construction of enclosed areas is the desire to create spaces for quiet and secluded meditation in accord with Javanese mysticism.

4. The dendritic pattern. This is related to the grid system in that it creates channels along which materials can flow. This can be human traffic, vehicles and goods, or water. Jacques Dumarçay demonstrated the importance of water circulation in the plan of the Taman Sari (Dumarçay 1978). He expanded on this theme in a later publication which dealt with the sophistication with which the properties of flowing water were integrated into architectural monuments in Cambodia and Java, including Trowulan (Dumarçay 1982).

The inclusion of flowing water as a determining factor in the layout of urban areas has not been properly incorporated into studies of early Southeast Asian cities. Certainly it is not easy to reconstruct ancient water channels, and dating them is almost impossible. Water is a dynamic element, which continually resists confinement, frequently destroys infrastructure set up to control it, and sooner or later defeats human endeavours to regulate its movement. Yet without serious efforts to understand the struggle to domesticate water, we will never understand the considerations which were in the forefront of the minds of early urban planners in this region, the wettest of any early urban area in the world.

Old royal gardens in Southeast Asia have been rather successful in surviving the forces arrayed against them. This characteristic, together with an inspired appreciation of their cultural importance, resulted in the important contribution to the subject by Denys Lombard (1969; English translation by Miksic 2008). Flowing water conferred several beneficial effects without which no early city could exist, but few studies have been devoted to this subject. Among these Malleret's *L'archéologie du delta du Mékong* (Malleret 1959-1963) deserves to be remembered, and recent research by Christophe Pottier (Pottier 1997) and the Greater Angkor Project of the University of Sydney (Fletcher *et al.* 2003) promise to rectify the situation. The desire to combine flowing water with monumental buildings and settlements, including special elite areas, has resulted in many combinations which are uniquely adapted to local topography, culture, and climate. One of the principal

Fig. 4: Aqueduct crossing palace moat, with Surosowan palace wall in background.

Fig. 6: Phimai, seen from the main street of the town

Fig. 5: Approach to Phnom Rong.

constraints imposed on urban planners by the propensity of water to flow downhill has been the arrangement of elite residential areas at the point where water enters the settlement, since that water is the cleanest. The conformation of the local topography then dictates the locations of the other tiers of the social hierarchy along the main water channel, with the lowest rung of the social ladder placed at the lowest elevation, which is in effect the drain for the entire settlement. Thus the flow of water governs the symmetry of early urban layouts.

One of the clearest instances of the effects of the combination of water, landform, and society is found at Banten Lama, West Java. Here in the seventeenth century a reservoir, Tasik Ardi, was constructed about a kilometer inland from a large settlement on the Northwest coast of Java. From Tasik Ardi, an aqueduct transported the water into the city. The palace, Surosowan, was built at the location where the water reached the urban zone **(fig. 4)**. From the palace, the water flowed into the main distribution network, at the lower end of which were the foreigners (Chinese and Dutch).

With the principal in mind that the elite will always reserve the purest water for itself, further exploration of the flow of water through ancient cities would reveal much about the locations of the elite residential zones. The relationship of topography to water and settlement was probably not always as obvious as might appear at first glance. The Pyu cities in Myanmar, for example, seem to have been organized according to a concentric pattern, with inner and outer precincts. It is possible that the palace was equipped with its own canal which brought water through the settlements of Halin, Beikthano, and Sri Ksetra. Other solutions to the problem of provision of clean water to a central location could of course have been found. At Sri Ksetra, for instance, where there is no evidence of any canal system, water may have come from wells, or from the Northeast sector of the enceinte, where there is no evidence of dense habitation. At Angkor, the east-West disposition of the large water features called *baray* was obviously intended to intercept the gradual seepage of surface run-off from the Phnom Kulen to the Tonle Sap. Angkor Thom is located where a large North-South canal enters the royal zone. We know too little about the distribution of population and the chronology of the various canals and other water features North of Angkor to understand how water may have related to social hierarchy, but it is indubitable that the management of water absorbed a great deal of the attention of the Khmer urban planners. Phnom Bakheng, the hill just South of Angkor Thom, played a significant role in the layout of the capital and its monuments, but it appears to have been subordinate to the constraints imposed on urban planners by the requirements of hydrology. In Angkor Thom, for example, the royal residence was not located at the center of the walled enclosure; in its final state, the Bayon temple stood there. The probable palace lay in the Northwest quadrant. It was provided with its own water storage facilities, the massive pools which still exist North of Phimeanakas.

5. The Axis. Beyond the mandala, the grid, and the dendritic patterns of urban design, is another variant: the axis. Although the main shrines of the great temple complexes of Angkor consist of Mt. Meru-like structures as at Angkor Wat, Preah Khan, or Preah Ko at Roluos for that matter, the overall plans of the complexes do not allocate the geometric center of the grounds to the tallest tower. Instead, the sanctuary is displaced to one side, in the case of Angkor Wat to the east. This asymmetrical layout does not betray any intention to recreate a mandala as a microcosm of the universe. Instead it clearly alludes to the entry to the temple as a pilgrimage through various types of space, with the goal of reaching the main shrine at the end of the journey. Many of the Khmer

temples built on hills exploit topography to accentuate this symbolism. It is clear from Phnom Bakheng, Phnom Krom, and Phnom Bok, the three hills around Angkor. It is even more obvious at the two great Khmer temples on the Khorat Plateau, at Phnom Rong and Phimai **(fig. 5)**. At Phimai, the temple stands on flat ground, but at the North end of the main street of the modern town **(fig. 6)**. It is not known whether this pattern replicates an ancient situation.

The axis emphasizes dynamic relations, whereas mandalas imply a static eternal reality. As a principle of urban planning, the axial pattern is well-known from China. At Beijing/Dadu, for example, the palace complex was located at the North side of the capital, North of a point where avenues runing North-South and East-West meet to form a T shape. A similar plan was used in the Ming dynasty at Nanjing. Although earlier Chinese capitals are not well-mapped, and not all capitals appear to have been arranged according to the same plan, the axial pattern can be traced back to Weiyang Gong, of the Han Dynasty.

Roads have been neglected as a potential factor in the spatial organization of temples and settlements in Indonesia. Enough information is now available to see that Trowulan's plan was dictated by two axes oriented approximately 14 degrees Southeast of true North-South and East-West. The site was originally oriented to a mountain, Penanggungan, 30 km Southeast of Trowulan **(fig. 7)**. Later buildings are oriented slightly further Southeast, toward another peak, Mt. Arjuna. The East-West axis was the key direction which determined the orientation of the North-South axis. The chthonic mode of thought has been acknowledged as a significant criterion in the design of temple plans in east Java (Baskoro 1992). It was probably used in the design of Trowulan as well.

Trowulan has been severely altered in the past 100 years. Generations of farmers have lowered much of the original land surface by approximately 2 m **(fig. 8)**. In the process, they have ground to dust much of the ancient capital – its bricks, its artifacts, its bones (literally and figuratively). Ironically, some of the brick dust has been added to soil in local brickyards or *bengkel bata* to make new bricks, which are sold in Surabaya and other large towns in eastern Java. Despite this distortion, one can still see an axial pattern in the modern roads and water features which it is logical to infer reflect a fourteenth-century situation **(fig. 9)**.

The center of the ancient capital was neither a temple nor a palace, but an intersection. This is stated clearly in the *Desawarnana*, canto 8, in its description of the "awe-inspiring royal palace", which refers to "the crossroads, other-wordly in its elegance" (Robson 1995: 29). Pigeaud (1963: V, plate II) in his reconstruction of the palace gave particular prominence to this feature. This crossroad probably corresponds to the intersection near the hamlet of Nglinguk, just North of Pendopo Agung. The North-South road runs from Pakis past Troloyo, Kedaton, Sentonorejo, and Segaran, to the east of Berahu. The East-West road, aligned with Mt. Penanggungan, runs from Mojoagung, the largest town in the vicinity about 5 km to the West of the crossroads, to Bajangratu and Candi Tikus.

These two roads divide the site into four quarters, which would conform in some respects to the *Arthasastra*, but the

Fig. 7: Mt. Penanggungan from Jabung

Fig. 8: The two-meter difference in elevation between irrigated rice land (sawah) and original land surface. By lowering the land, farmers are able to grow two crops per year

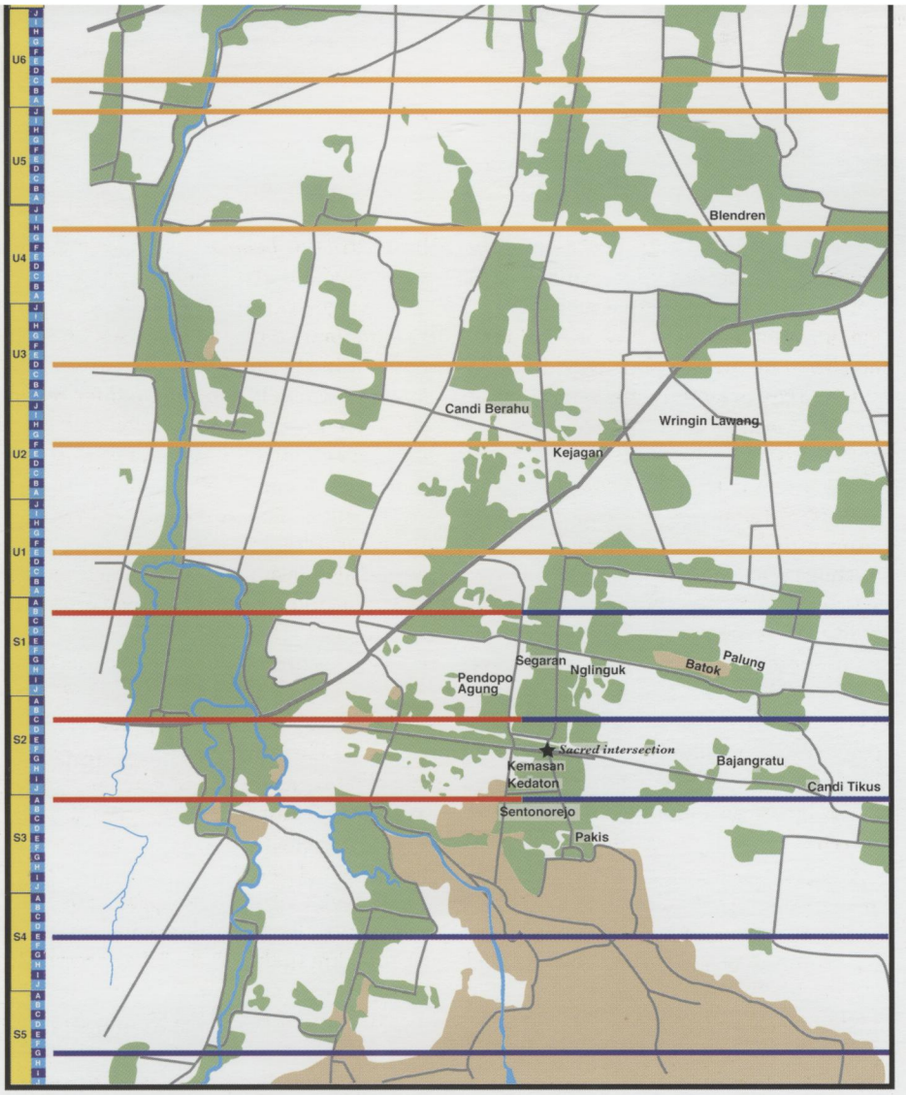


Fig. 9: Topography of Trowulan. White: low-lying irrigated land; green: dry land, village, roads, etc. approximately 2 m higher; brown: foot of Anjasmoro volcanic complex. Red lines: survey transects of 1991; blue: 1992; green: 1993.

allocation of space in the *Desawarnana* makes no reference to Varnas. The four quarters thus formed probably expressed the fundamental design principal governing the layout of the capital. As at Loro Jonggrang, where the center of the site was occupied by a small shrine to the local gods of the soil, the center of Majapahit was probably also perceived as dangerous. Contrary to the *Arthasastra*'s advice, but consistent with Balinese cosmology, the royal quarter was in the Southwest, where Kedaton ("palace") and a number of other hamlets are found including Sentonorejo (*sentana*, an official rank), Kemasan (*mas*, "gold") where gold has been found, and Sumur Upas ("well of poison"), probably where oaths of loyalty were taken. Most religious edifices which have survived lie along the North-South axis.

One reason why Trowulan has not attracted much interest from either the public or from historical preservationists is its dearth of monuments. The city's plan dictated the placement of religious structures rather than the reverse. The city was not a major center of religious life. The *Desawarnana* describes royal processions, which in some years travelled hundreds of kilometers, filling the breadth of the royal highway with carriages, oxcarts, elephants, and horses. Important nobles had carriages with their own symbols, such as a sun, a bull, or a flower. Travel by road seems to have been a regular form of transport. It is therefore not surprising that roads dictated the form of the royal capital.

The field of Bubat where public spectacles took place was the North of the city. Bubat was bounded on the east by "the royal road", and on the North by a river. The royal road ran from the city to some other location, perhaps the bank of the Brantas River or beyond. That there were ferries at rivers to assist overland transport is proven by the Ferry Charter of 1358 (Pigeaud 1962: IV, 399-411), which regulates ferries in the Brantas and Solo rivers, and another charter from the upper Solo River, dated 903.

The fifteenth-century Chinese text *Yingyai Shenglan* said that the country of Java had four unwalled towns. Majapahit, "where the king lives", was a royal residence 1 1/2 days' walk from the nearest place accessible by river (Groeneveldt 1960: 46). Thus the capital was linked to the nearest waterway by land. *Desawarnana*, canto 88 stanza 2, the prince of Wengker orders local officials to make their districts prosperous by constructing and maintaining bridges, main roads, and other useful public works (Robson 1995: 89).

Alfred Russel Wallace passed through Trowulan in the 1860s (the main road between Surabaya and Jakarta still runs through Trowulan).

> On our way we stayed to look at a fragment of the ruins of the ancient city of Modjo-pahit, consisting of two lofty brick masses, apparently the sides of a gateway. [This must have been the site of Wringin Lawang] The extreme perfection and beauty of the brickwork astonished me. The bricks are exceedingly fine and hard, with sharp angles and true surfaces. They are laid with great exactness, without visible mortar or cement, yet somehow fastened together so that the joints are hardly perceptible, and sometimes the two surfaces coalesce in a most incomprehensible manner.

Fig. 10: *Segaran Site, Square I-10 spit 3, July 26, 1986, cobblestone floor with brick foundations.*

Fig. 11: *Indonesian archaeology student (in white hat) collecting sherds in the vicinity of a bengkel bata (brick-making workshop).*

> Such admirable brickwork I have never seen before or since... Traces of buildings exist for many miles in every direction, and almost every road and pathway shows a foundation of brickwork beneath it – *the paved roads of the old city.* (WALLACE 1869: 77; emphasis added).

Unfortunately the preservation of Wringing Lawang, the brick gateway in the Northeast sector of Trowulan which Wallace saw in the 1860s, is an exception. Already in 1939 the archaeological report *Oudheidkundig Verslag* published warnings about "roving collectors" at the site. Between 1975 and 2005, a vast area of brick ruins mixed with millions of artifacts has been consumed by local *bengkel bata.*

Archaeological Research

The Indonesian National Research Centre for Archaeology (Puslit Arkenas) investigated Trowulan from 1976 to 1990 (STAFF 1995). The site was defined as a single "cultural unit", one urban system consisting of habitation clusters. This conforms to the image of Trowulan as a set of discrete walled compounds containing residential quarters similar to modern Balinese *banjar.* The *Desawarnana* refers to them as *kuwu.*

An habitation zone was excavated by the Faculty of Letters, University of Indonesia. Excavation about 400 m Southwest of the Segaran Pool revealed foundations of buildings floored with cobblestones, interior partitions, and a well. A rectangular foundation 4 x 2 m, the long sides oriented about 12 degrees Northeast, lay upon a disturbed layer of fill containing fragments of brick and earthenware. The building was provided with a brick drain **(fig. 10)**.

Sentonorejo

Sixteen large pillar bases of stone on a brick foundation, arranged in two rows running East-West, lie 500 m South of Pendopo Agung. Excavators found fragments of earthenware, porcelain, and stoneware, metal, Chinese coins, charcoal and faunal remains. Imported ceramics included Chinese wares of the tenth to sixteenth centuries, and Thai and Viet wares of the fourteenth to sixteenth centuries. Imported ceramics declined suddenly in the seventeenth century. This supports historical sources stating that Majapahit flourished during the fourteenth and fifteenth centuries, then disappeared during the sixteenth century.

Nglinguk

Nglinguk was found to have been a multiphase habitation cluster, with several superimposed brick structures with different orientations. The habitation areas contained dense concentrations of domestic refuse: earthenware, stoneware, and porcelain, other household utensils, and numerous wells. Many sherds of high-quality Chinese ware imply that Nglinguk residents were members of the elite.

Batok Palung

Excavations revealed a layer of animal bone, approximately one meter thick and extending over an area of about one hectare, containing remains of buffalo, cattle, chicken, pig, goat, and rat. Some had been boiled or roasted. Among the faunal remains were fragments of earthenware, stoneware, and porcelain.

Kejagan

Surveys yielded terracotta figurines and molds for making them. Excavations imply that Kejagan was a multiphase ceremonial site, based on the discovery of miniature buildings probably used for ceremonies, and large earthenware containers probably used for offerings.

Blendren

Remains of a brick-lined artificial spring-fed pool and the mouth of an underground channel distinguish this site. In the rainy season a quantity of water sufficient to water the nearby rice fields flows from this channel; in the dry season residents use the spring for bathing and washing.

Fig. 12: *Gold pendant inset with semi-precious stones, found at Kedaton.*

The Indonesian Field School of Archaeology

In 1991 IFSA (Indonesian Field School of Archaeology) was instituted with a grant from the Ford Foundation and matching support from Puslit Arkenas. The project aimed to determine the borders of the urban area and to obtain some idea of the density of occupation remains within those borders. The results demonstrated that remains of densely settled clusters of the fourteenth and fifteenth centuries were spread over 100 km². Seventeenth-century Mataram only covered 41 km² (Reid 1993: 74). At the same time Thang-long (Hanoi) only covered 22 km². Estimates of its population varied from 130,000 to one million. It is now possible to designate fourteenth-century Trowulan a heterogenetic city **(fig. 11)**.

Although the boundaries of the site have now been approximately determined and dense areas of habitation have been detected, the population of the site cannot be estimated because large areas of the site have been destroyed. Probably an appreciable portion of the site was devoted to reservoirs, open fields as described in the *Desawarnana*, and religious sanctuaries. Descriptions of these mention flowers and trees which grew around them. For example the Kanuruhan inscription, found near Malang, East Java, dated 856 Saka records the presentation of land to be made into a flower garden (Edi Sedyawati 1994: 121). If only 50% of Trowulan were devoted to habitation, rough calculations based on expected density of inhabitants per square kilometer yield a minimum population of 200,000.

IFSA survey recovered 100,000 artifacts, including Chinese wares mainly of the fourteenth century, but with ninth and tenth century examples in the Kejagan sector, and late Ming sherds near Mojoagung. The Alasantan inscription dated 6 September 939 CE proves that in the pre-Majapahit era the area had been a *sima*, where residents were freed from taxes in return for rendering services to a religious institution.

Settlement Pattern

Neither literary sources nor archaeology describe the use of space in Majapahit's capital: the density of buildings, the proportion of space devoted to various types of uses, etc. Temple reliefs do not depict urban scenes, but they do contain sketches of settlements, including groups of pavilions surrounded by walls. Prapanca mentions several *kuwu*, walled compounds in which lived a noble, his family, servants, slaves, and others attached to him by various forms of clientship. How large and how far apart were these *kuwu*? How was the ground between them used? Were they separated from the *nagara* by rice fields, and thus outside of it? We can only speculate on these matters.

Majapahit's capital was wealthy. Many pieces of gold jewelry have been discovered on the site, but unfortunately most have found their way into private collections, and have little relevance to archaeological reconstruction. Although Java has no large sources of gold, Majapahit's connections with islands such as Sumatra, Borneo, and Sulawesi, where ancient mines existed, made it possible for many goldsmiths to find work in Java. At Kemasan not only gold ornaments but also tools such as small anvils and clay cups used as crucibles for melting gold for use in lost-wax casting have been found **(fig. 12)**.

Not far away, at Pakis, a large number of clay crucibles for melting bronze have been excavated. Some of the bronze was used to make *uang gobok*, large coins or amulets, stone molds for which have been found.

A fourteenth-century source mentions a court official whose duty was to protect the markets. "Eight thousand cash every day from the markets is the share" which this official received. The "cash" referred to are Chinese coins. In about 1300 Majapahit adopted Chinese coins as its official currency, used in paying fines, taxes, and other obligations, in place of Javanese gold and silver coinage which had been in use for centuries. Chinese coins were preferred because they were available in small denominations, suitable for use in markets.

Pottery forms one of the most important sources of information about early civilizations. Pottery products found at Majapahit's capital indicate that this craft was an important activity here too. The range of clay objects found at Trowulan is very wide, and further research will undoubtedly uncover yet more types. Some of the more elaborate items must have been made by professional potters.

Terracotta figurines were produced in large quantities. They represent many subjects: gods, humans, animals, buildings, scenes. We do not know what they were used for; perhaps they had several functions.

The data, although not enough to provide detailed information on the

distribution of activities with precision comparable to Anuradhapura, show that a wide range of economic activities was conducted on the site, and that money was a familiar aspect of everyday life. Economic factors were certainly a significant influence on life in the city, and probably on the urban groundplan as well.

Majapahit Temples.

Kieven (2009: 187) argues that the Javanese of the Majapahit period were interested in the yogic path, which entails a vertical axis formed by the various *cakra* in the human body. In east Java, there are no large mandala-like complexes such as Loro Jonggrang or Sewu. The layout of the east Javanese complex at Panataran grew up over a fairly long period, and may preserve some aspects of a compromise between the axis and the mandala, such as is also found in Bali. The metaphor of the straight pathway would be more relevant in a society dominated by yogic ideas than a concentric layout. The evolving popularity of yoga tantra in the Majapahit period would thus be one factor (among several) which could help to explain the major differences between the religious complexes of central and east Java.

Few temples in Trowulan have been preserved. Several reasons are probably responsible for this; however, it seems that religious structures occupied less space in Trowulan than habitation remains. Javanese society during the Majapahit period preferred to locate its religious structures and activity centers in rural areas. The influence of temple locations and plans on the city was probably not a significant factor in determining Trowulan's ground plan.

Majapahit rulers were *didharmakan*, "memorialized", at certain places. In 1365 there were 27 religious domains where religious sanctuaries were set up in the names of particular rulers. Prapanca describes his visit to the abbot of a religious complex to collect information about King Hayam Wuruk's lineage and religious domains set up in the names of the king's ancestors. For example

Fig. 13: *Brick-lined well in process of being dismantled for building material.*

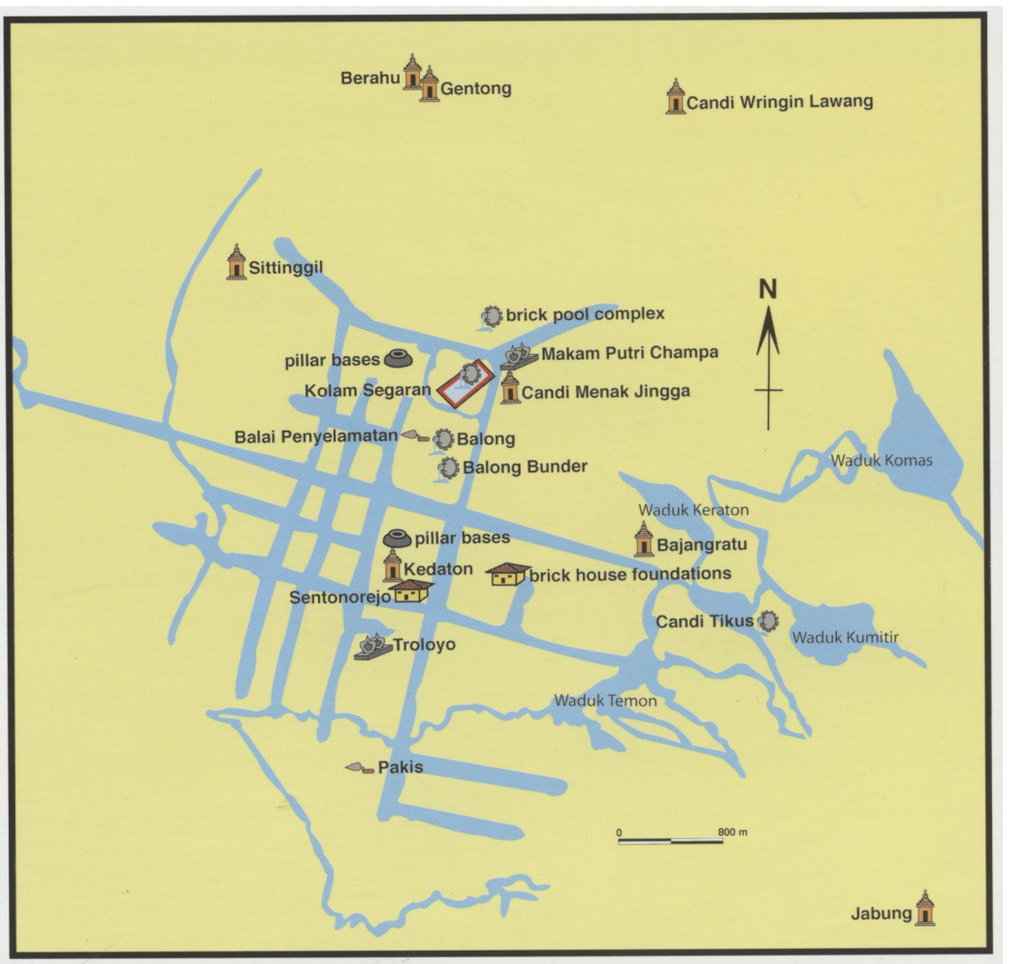


Fig. 14: *Hypothetical system of canals and reservoirs (waduk) in* fourteenth-*century Trowulan. Based on Karina Arifin 1983, Mundardjito et al 1986.*

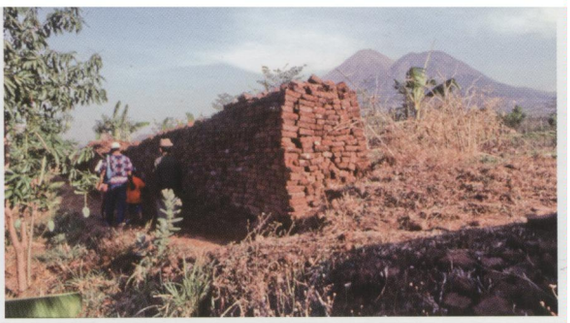
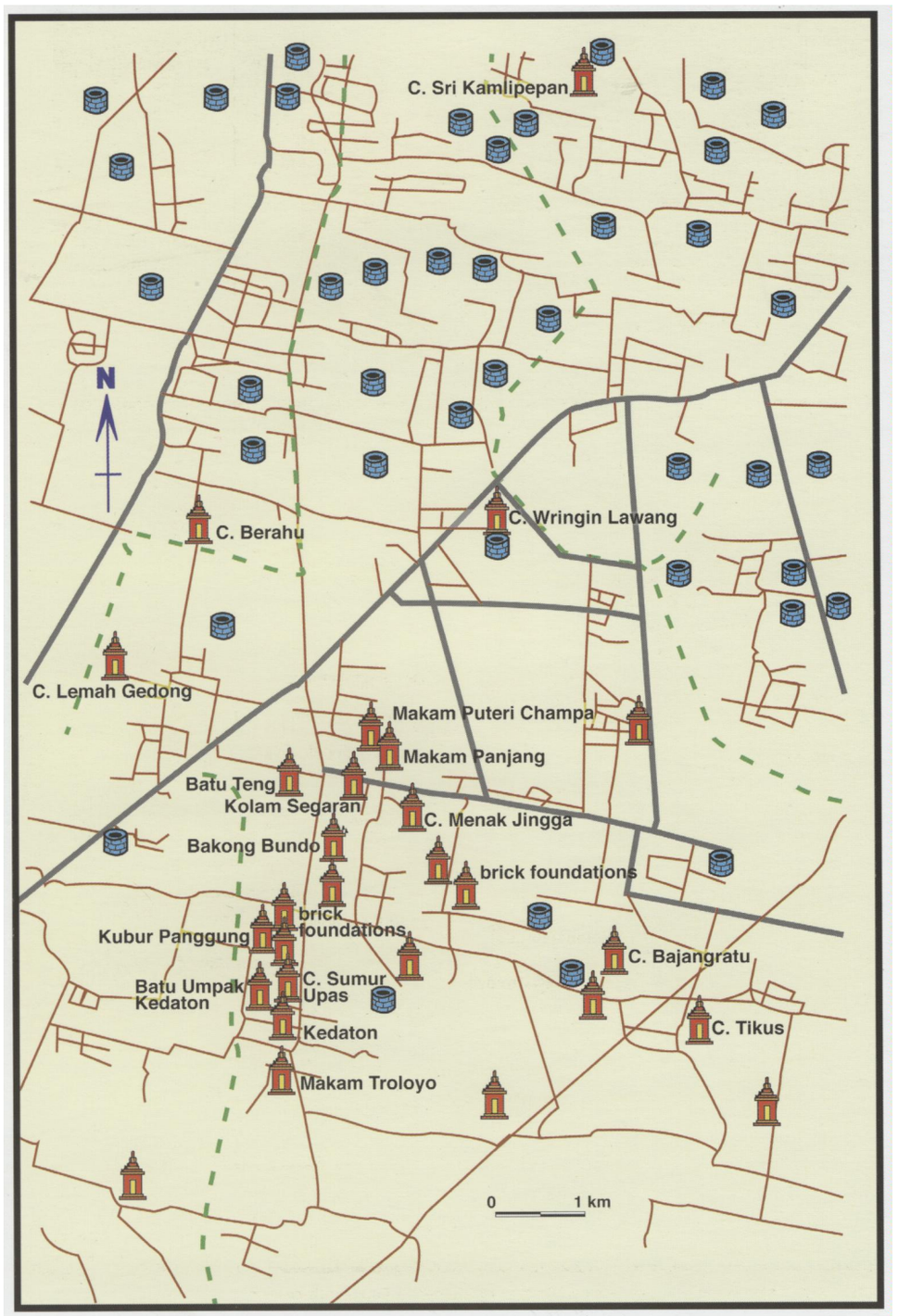


Fig. 15: *Remains of ancient bricks at Kuto Girang, stacked for removal, with Mts. Welirang and Arjuna in the background.*

Fig. 16: *Distribution of wells and temples in Trowulan.*



Raden Wijaya, founder of Majapahit, was portrayed as a Buddhist image in the palace, and as Siva in Simping, 150 km Southwest of Trowulan.

While the royal cults produced some great statuary, many subjects of Majapahit were more attracted by the worship of hermits or rishi. The West slope of Mt Penanggungan Southeast of Trowulan is dotted with over 50 *punden berundak,* sets of terraces averaging one meter wide and about 10 m long, which ascend the mountain slope like stairs. Other *punden* were constructed on Mt Arjuna, Mt Lawu, Muria and Wilis. These sites, rather than temples in the *nagara*, were the most significant religious centers of Majapahit. The complex of Panataran, the largest ceremonial center of the kingdom, was about 150 km from the capital.

Water and Settlement Patterning

Water supply was one of the most critical factors facing an ancient city. A large reservoir, the *Segaran* ("Ocean"), occupies a site quite close to what must have been the center of Majapahit's capital. Wells lined with bricks or clay rings have been found in several parts of the site **(fig. 13)**. A fourteenth-century bathing place, Candi Tikus, has been preserved on the Southeast edge of the site. Traces of what may have been canals for water circulation found on aerial photographs form a grid pattern.

One of Maclaine Pont's most useful contributions was his study of the hydrology of the region between Trowulan and Tarik (Maclaine Pont 1925, 1927). His engineering expertise was put to good use in identifying various canals and dams which had probably been in use for centuries. He was able to show how they were connected with remains of reservoirs in the Trowulan area. Waduk Kumitir seems to have been Trowulan's main reservoir in ancient times, providing water for the canals of the city as well as rice fields. Later other smaller reservoirs were built.

It is difficult to date hydraulic features such as canals. This is especially true in

Trowulan, where it seems that the grid pattern observed by Karina Arifin (1983) may be very old, but the canals themselves have been widened and converted into rice fields, making their original size and age difficult if not impossible to ascertain **(fig. 14)**. Several sites on the slopes of the Arjuna/Penanggungan massif with remains of dams and dated inscriptions support the conclusion that Majapahit's capital was supported by an elaborate water management system. At Kutogirang, 175 m above sea level, is an inscription dated 1432 CE. At Juju, 10 km away, are four inscriptions, two from 1485, one of which mentions a dam (Pieter Ferdinandus n.d.) **(fig. 15)**.

A comparison of the locations of wells and religious structures at Trowulan reveals an interesting pattern. The distribution of the two types of remains is quite different. The wells have been dug in certain places where the water table is closest to the surface of the ground. Temples were situated in other areas. Perhaps this was done in order to maximize the water resources of the site to support a dense population **(fig. 16)**.

Conclusion

Trowulan has been more intensively investigated than any other large urban site from the pre-Islamic period in Southeast Asia. The significance of the accumulating data from Trowulan to assist in the clarification of early urbanization in Indonesia can now be explicated more clearly than previously.

Neither the Javanese nor any other Southeast Asian culture had a concept exactly equivalent to the modern Western "city". It seems that there are many paths to urbanization, and that the present situation in which all countries in the world now possess entities superficially alike is the result of a process of convergent evolution in which structures analogous rather than homologous have formed (Miksic 1989).

The fourteenth century Javanese did have the idea of an urban area marked by the absence of agriculture. The *Nawanatya,* selections from a primer of court etiquette, contains the rhetorical question, "What is called the *nagara*? All where one can go out (of his compound) without passing through paddy fields" (Pigeaud 1960-63: III, 121). Literary sources from Southeast Asia should be exploited to gain further insight into human spatial behavior, in conjunction with archaeological data. Much variation between areas can be expected. The types of settlement units recognized by the people of Java for example are likely to have been significantly different from those of Sumatra or Cambodia. Many archaeologists assume that modern concepts of urbanization can be directly applied to the past and to any part of the world. A moment's reflection will serve to illuminate the absurdity of this notion. The nature of cultural evolution in Southeast Asia will only be clarified if each part of the region is viewed in its own terms rather than as an example of a larger regional identity.

Another obvious source of information is analogy with Islamic-period palace complexes in Java. The popularity of the terms *pakubuwana* and *pakualam* for example in the naming of palaces (both meaning "nail of the world" or "axis") used in Surakarta and Yogyakarta are no doubt evidence for continuity between Majapahit and early Islamic-period palace groundplans. As the foregoing discussion suggests, although we have no confirmed design for the Majapahit palace, it too was probably organized around the symbolism of an axis rather than a mandala. The use of the term "nail of the world" as a palace name is perhaps rather more straightforward and literal-minded than would have been comfortable for early Javanese, who enjoyed circumlocutions, but if we equate the layout of the ruins of Trowulan with a plan dictated by the desired symbolism for a center of activity and significance at once royal and sacred, then it is logical to derive the plans of Surakarta and Yogyakarta from a fourteenth-century predecessor. The intermediate examples of Demak, Banten Lama, and Cirebon all demonstrate the same principles: two palace squares, North and South of the *dalem* or royal abode, thus forming another pathway. One can see evidence for such layouts even in such frontier areas of Javanese culture as the Malay palaces of Kota Bahru in Kelantan, Malaysia, and Kampong Gelam, Singapore. On the other hand, one could even argue that the initial stimulus for the axial pattern came not from Java but from the Straits of Melaka. The royal complexes of Palembang (Sriwijaya), Singapore (Temasik) and Melaka form a sequence of development spanning 800 years. All three are similar in layout: a hill overlooking an estuary was the site of significant elite activity. In the examples of Palembang and Singapore, the hill lay at the inland extremity of the main population center, whereas Melaka deviates from this in that the hill lay directly on the shore, but the main settlement there seems to have lain across the river and was perhaps connected to the royal zone by the famous bridge mentioned in the Portuguese sources. Though we do not have any information about the use of space or the disposition of paths and gateways which would have controlled human movement in the palace areas, we can imagine that hills as pilgrimage places would have also lent themselves to some sort of axial pattern. The discovery of the many stones inscribed with *siddhi* in Palembang, and the name *Bukit Larangan* which still clung to Fort Canning Hill in 1819 both suggest that access to the hills was a privilege, and therefore pathways to the summit were probably strictly limited and prescribed.

"We lack a study of the remains of Majapahit, a study which conforms to the demands of archaeology" (Veth 1896: 207). Sadly this lament still applies today. Despite the considerable amount of research which has been accomplished, we are still far from understanding much about the society of this early city. The chance that such a study can ever be performed diminishes with every passing year.

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Bibliography

Baskoro D. Tjahjono, 1993: "Gejala perubahan orientasi kosmis ke ktonis pada arsitektur bangunan sakral Majapahit akhir." *Pertemuan Ilmiah Arkeologi VI*, Batu, Malang Jawa Timur 26-30 Juli 1992. "Sumbangan Arkeologi Untuk Perkembangan Masyarakat dan Kebudayaan Indonesia."

Bondan Hermanislamet, 1998: *Tata Ruang Kota Majapahit. Analisis Keruangan Bekas Pusat Kerajaan Hindu Jawa Abad XIV di Trowulan Jawa Timur*, Yogyakarta: Universitas Gadjah Mada.

Christie J.W., 1992: "Trade and settlement in early Java: integrating the epigraphic and archaeological data", in *Early Metallurgy, Trade and Urban Centres in Thailand and Southeast Asia* (eds I. Glover, P. Suchitta, and J. Villers), Bangkok: White Lotus, p. 181-197.

Coningham R., 2000: "Contestatory urban texts or were cities in South Asia built as images?", *Cambridge Archaeological Journal*, 10,2: p. 348-354.

Dumarçay Jacques, 1978: « Le Taman Sari (étude architecturale). », *BEFEO* 65 : p. 589-624.

— 1982: « Notes d'architecture javanaise et khmere.», *BEFEO* 71: p. 87-145.

Edi Sedyawati, 1994: *Ganesa Statuary of the Kadiri and Singasari Periods*, Leiden, KITLV.

Evers Hans-Dieter, 1984: "Cities as a 'field of anthropological studies' in South-East Asia.", in P.E. de Josselin de Jong, ed, *Unity in Diversity. Indonesia as a Field of Anthropological Study*, Dordrecht: Foris, p. 143-151.

Ferdinandus Pieter n.d. Kuto Girang Research Report. Unpublished Manuscript. Jakarta: Pusat Penelitian Arkeologi Nasional.

Fletcher R.J. and Barbetti M., Evans D., Than H., Sorithy I., Chan K., Penny D., Pottier C. and Somaneath T., 2003: "Redefining Angkor: structure and environment in the largest, low density urban complex of the pre-industrial world.", *Udaya* 4: p. 107-21.

Groeneveldt W.P., 1960: *Historical Notes on Indonesia and Malaya Compiled from Chinese Sources*, Jakarta, Bhratara.

Karina Arifin, 1983: *Waduk dan Kanal di Pusat Kerajaan Majapahit Trowulan – Jawa Timur*, Skripsi Sarjana, Jakarta, Fakultas Sastra Universitas Indonesia.

Kieven Lydia, 2009: *Meaning and Function of the figures with a cap in reliefs at East Javanese temples of the Majapahit period. A contribution to a new understanding of the religious function of the temples*, Ph.D. Dissertation, Department of Southeast Asian Studies, University of Sydney.

Lombard Denys, 1969 : « Jardins à Java », *Arts Asiatiques* IX : p. 135-184.

Maclaine Pont Ir. H., 1925: "Madjapahit. Poging tot reconstructie van het Stadsplan, nagezocht op het terrein aan de hand van den middeleeuwschen dichter: Prapanca", *Oudheidkundig Verslag 1924*, Bijlage D., p. 36-75, Bijlage Q., p. 157-199.

— 1926: "De historische rol van Majapahit", *Djawa* 6: p. 294-317.

— 1927: "Eenige oudheidkundige gegevens omtrent den middeleeuwschen bevloeiingstoestand van de zoogenaamde 'woeste gronden van de lieden van Trik' voor zoover zij wellicht van belang zullen kunnen zijn voor eene herziening van den tegenwoordigen toestand", *Oudheidkundige Verslag 1926*, Bijlage G., p. 100-129 and plate 15.

Malleret Louis, 1959-1963 : *L'archeologie du Delta du Mekong*, Four Volumes, Paris, Publications de l'École française d'Extrême-Orient.

Miksic J.N., 1989: « Urbanization and social change: the case of Sumatra », *Archipel 37*, p. 1-29.

— 2000: "Heterogenetic cities in premodern Southeast Asia", *World Archaeology* Volume 32,1: p. 106-121.

— 2008: Translator Denys Lombard, *Gardens in Java*, Jakarta, Pusat Penelitian dan Pengembangan Arkeologi Nasional.

Mundardjito *et al*, 1986: *Rencana Induk Arkeologi Bekas Kota Kerajaan Majapahit Trowulan*, Jakarta, Proyek Pemugaran dan Pemiliharaan Peninggalan Sejarah dan Purbakala.

Pigeaud T. G. Th., 1960-1963: *Java in the 14th Century. A Study in Cultural History*, The Hague, M. Nijhoff, 5 volumes.

Pottier Christophe, 1997 : "Élaboration d'une carte archéologique de la région d'Angkor : l'organisation du territoire angkorien", *Southeast Asian Archaeology 1994. Proceedings of the 5th International Conference of the European Association of Southeast Asian Archaeologists*, Paris, 24-28 October 1994, Vol. I. ed, Pierre-Yves Manguin, Hull, Centre for Southeast Asian Studies, University of Hull, p. 179-194.

Reid Anthony, 1993: *Southeast Asia in the Age of Commerce 1450-1680*, Volume Two: "Expansion and Crisis", New Haven, Yale, 1993.

Robson S., 1995: translator *Deśawarṇana (Nāgarakṛtāgama) by Mpu Prapañca*, Leiden: KITLV Press. VKI 169.

Staff Pusat Penelitian Arkeologi Nasional/National Research Centre for Archaeology of Indonesia, 1995: "Research on the Majapahit city at the site of Trowulan, East Java" In J.N. Miksic and Endang Sri Hardiati, eds. *The Legacy of Majapahit*, Singapore, National Heritage Board, p. 19-30.

Veth P.J., 1896-1903: *Java: Geografisch, Ethnologisch, Historisch*, Haarlem, F. Bohn.

Wallace A.R., 1869: *The Malay Archipelago*, London, Macmillan.

Wheatley P., 1971: *The Pivot of the Four Quarters*, Chicago, Aldine.

— 1983: *Nagara and Commandery*, Chicago, University of Chicago, Department of Geography.