



Submitted: 9th June 2024
Revised: 14th June 2024
Accepted: 26th June 2024

Correspondences:

¹Doctoral Program,
Department of Architecture
and Planning, Faculty of
Engineering, Gadjah Mada
University, Indonesia

^{2,3}Department of Architecture
and Planning, Faculty of
Engineering, Gadjah Mada
University, Indonesia.

E-mail: ¹tinaadianti@ugm.
ac.id, ²ikaputra@ugm.ac.id

Orchid: ¹<https://orcid.org/0000-0001-5417-0441>
²<https://orcid.org/0000-0003-0451-6699>

Impact Permeability Study Transition from Residential Function to Educational Function in Dalem Mangkubumen, Yogyakarta

Istiana Adianti¹, Ikaputra², and Dwita Hadi Rahmi³

¹Doctoral Program, Department of Architecture and Planning, Faculty of Engineering, Gadjah Mada University, Indonesia

^{2,3}Department of Architecture and Planning, Faculty of Engineering, Gadjah Mada University, Indonesia

Abstract: *Dalem* Mangkubumen, is a residential house specifically for nobles in the Yogyakarta Sultanate. *Dalem* Mangkubumen itself was built as the home of the crown prince Sri Sultan Hamengku Buwono VI. It cannot be denied that Mangkubumen has the largest land area and grandeur like Karton Yogyakarta. It was built in 1876 and still stands today. Since its founding until now, its function has changed, it was built as a residence and then changed to an educational function. This change in function has an impact on changes in building use and building additions to meet their needs. This qualitative research examines how permeable the spatial layout is when it functions as a residence and changes to an educational function. Using data that has been written down, both old maps and previous articles, as well as direct observations in the field, the latest map modifications and a list of spatial changes have been obtained. These data are used to see changes and assess permeability. The level of permeability and changes in permeability in the zones within Mangkubumen can be seen.

Keywords: function; *Dalem* Mangkubumen; permeability

Abstrak: Studi Permeabilitas Dampak Transisi dari Fungsi Hunian ke Fungsi Pendidikan di Dalem Mangkubumen, Yogyakarta. *Dalem* Mangkubumen, merupakan rumah hunian dikhususkan untuk bangsawan di lingkungan kasultanan Yogyakarta. *Dalem* Mangkubumen sendiri dibangun sebagai rumah putra mahkota Sri Sultan Hamengku Buwono VI. Tidak dipungkiri *Dalem* Mangkubumen, memiliki luas lahan yang paling besar dan kemegahan seperti Karton Yogyakarta. Dibangun pada tahun 1876 dan masih berdiri hingga saat ini. Semenjak berdiri hingga saat ini mengalami perubahan fungsi, dibangun sebagai hunian kemudian beralih menjadi fungsi pendidikan. Perubahan fungsi tersebut, berdampak pada perubahan penggunaan bangunan dan penambahan bangunan guna memenuhi kebutuhan. Penelitian secara kualitatif ini, mengkaji seberapa permeabilitas tata ruang saat berfungsi sebagai hunian dan berubah menjadi fungsi pendidikan. Menggunakan data yang pernah dituliskan baik peta lama maupun artikel terdahulu serta amatan langsung dilapangan, didapatkan modifikasi peta terbaru dan daftar perubahan ruang. Data-data tersebut digunakan untuk melihat perubahannya dan mengkaji permeabilitasnya. Terlihat tingkatan permeabilitas maupun perubahan permeabilitas dalam zona-zona yang terdapat di *Dalem* Mangkubumen.

Kata kunci: fungsi; *Dalem* Mangkubumen; permeabilitas



1. Introduction

Yogyakarta, which is close to the Royal City, was founded in 1755 with the Kraton as the center of government and the king's residence. The Kraton complex is surrounded by a fort known as *baluwarti*, while the area inside is called *Jeron Beteng* (inside beteng). The *Jeron Beteng* area is an area that is still developing today and is a cultural heritage area (Sektiadi, 2015). *Dalem Mangkubumen* as part of *Jeron Beteng* is a heritage building and is one of the *Dalem's* registered as a cultural heritage building in Yogyakarta in 2010 (Cahyandari et al., 2019). *Dalem* itself is a term for residential buildings intended for nobles (Adianti, 2019). The name after the word *dalem* is adjusted to the name of the nobleman who lives in the building. *Dalem Mangkubumen* was founded in 1874 based on the inscription on one of the buildings (Bangsal Sriwedari), *Dalem Mangkubumen* itself was built during the reign of Sultan Hamengku Buwono VI (Yuniastuti, et al, 2014). This palace is intended as a residence for the future Crown Prince of Sultan Hamengku Buwono VII, namely Prince Adipati Anom Hamengkunegoro. After Prince Adipati Anom became king, this *Dalem* was inhabited by his younger brother, Prince Mangkubumi, in 1918. When it was used by Prince Adipati, the palace was known as *Dalem Kadipaten*, but after being used by Prince Mangkubumi it became known as *Dalem Mangkubumen*. *Dalem Mangkubumen* underwent several changes in function, initially as a residence, and most recently functioned as an educational facility until now (Yuniastuti & Murti, 2019).

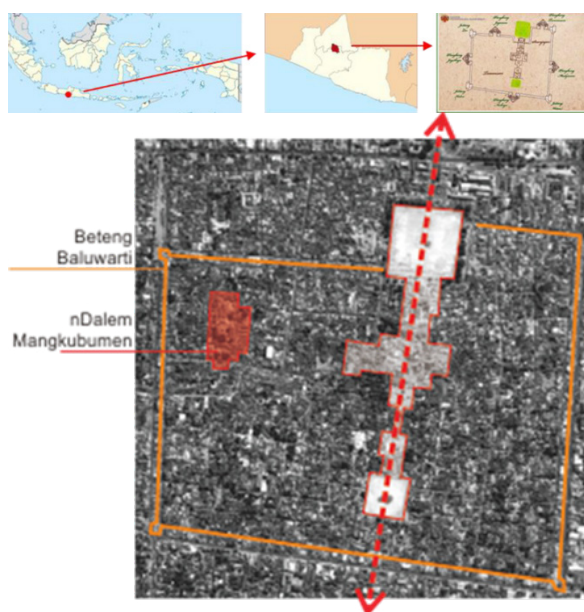


Figure 1: Location *Dalem Mangkubumen*
(Source: Adianti, et al., 2023 and Adianti, 2020)

2. Research Formulation

Dalem Mangkubumen was originally built as a residence for the Crown Prince. Therefore, the area, size architectural style, and completeness of *Mangkubumen* are similar to the Yogyakarta Palace (Yuniastuti, et al, 2014). *Dalem* is the most complete typology of traditional Javanese houses. Physically, the palace is limited by a 2-3m high fortress with a land area ranging from 2,000 – 10,000 m² (Siti Widayatsari, 2002). The entrance access called *gledekan* has varying lengths measured from the main road to the *regol* (gate) of the palace. The main hall structure of the palace is divided into 3 (three), namely *pendapa-dalem-gandok*. The changes in function experienced by the *Dalem Mangkubumen* also influence changes in spatial planning. This change in function occurred during the reign of Sultan Hamengkubuwono IX, who officially allowed the Yogyakarta Palace to use the performance area for higher education institutions as a lecture hall (Roem, 2011). The king's policy also influenced the actions of the nobles, allowing parts of the palace to be used for social purposes.

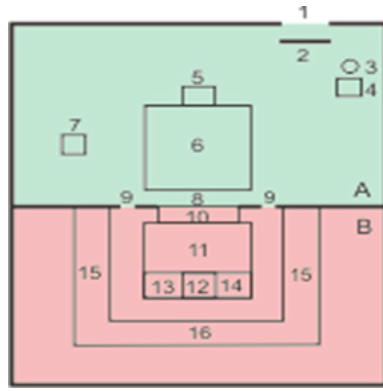


Figure 2: Layout *Dalem* Mangkubumen (Source: Wibowo, 1998)

- | | | | |
|------------|-----------------|---------------------------|---------------------|
| 1. Regol | 6. Pendopo | 11. Dalem | 16. Dapur |
| 2. Rana | 7. Kandang kuda | 12. Senthong tengah | A. Halaman depan |
| 3. Sumur | 8. Longkangan | 13. Senthong tengen/kanan | B. Halaman belakang |
| 4. Langgar | 9. Seketheng | 14. Senthong kiwo/kiri | |
| 5. Kuncung | 10. Pringgitan | 15. Gandok | |

Dalem Mangkubumen currently functions as a place of education and settlement. This settlement emerged from the dalem's first function as a noble residence which of course required servants (*abdi dalem*) to serve the house owner daily. As long as servants serve the palace owner and his family, they are allowed to live in the palace fortress. Some of the descendants of these servants still live in the *dalem* Mangkubumen, apart from the descendants of the Mangkubumen palace owners. This change in function affects the spatial layout of Mangkubumen from its original function as a residence to its current educational function. It cannot be denied that the current function is changing the function of the original building as well as adding space both within the original building and adding new buildings, to fulfil the current function of the *Dalem* Mangkubumen.

According to Rossini, F, et al (2018), permeability is generally the ability of a material to allow fluid to pass through without changing its original structure. *Dalem* Mangkubumen has a distinctive spatial pattern structure. As a result of changes in the function of the interior, new spaces emerged. Additions and changes to space due to changes in function will be studied in this research. Another expression of this study is how permeable *dalem* Mangkubumen is in responding to changes in function.

3. Discussions

Dalem Mangkubumen is located in the *Jeron Beteng* area which is located west of Kraton Yogyakarta. Located approximately 300 m from Kraton, it is part of the Kadipaten sub-district of Yogyakarta, DIY. Assessing the permeability of Mangkubumen, using qualitative methods. Qualitative is a search to understand certain phenomena. The results of this research are presented descriptively based on the interpretation of

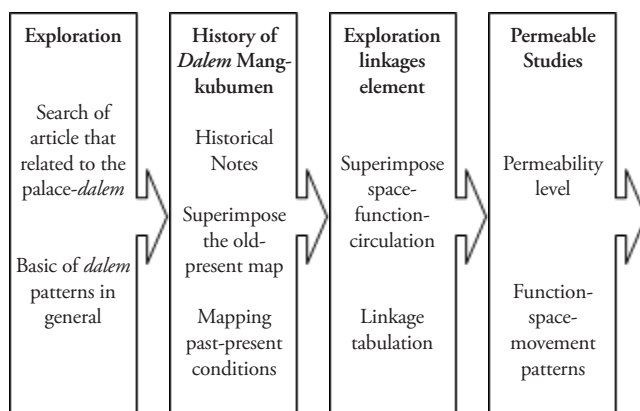


Figure 3: Collecting data dan analysis

data collected by researchers (Fiantika, 2022). Data was obtained by digging up related articles or books, old maps, observations, and interviews. Based on these data, we can find the historical process of *Dalem Mangkubumen*, both changing the function of the building and adding space to support new functions. The data is presented in the form of maps and narratives so that changes in spatial layout can be seen. Through this map, a permeable hierarchical grouping can be created when it is a residential function and when it is an educational function.

3.1 History and Spatial Planning of Dalem Mangkubumen

The construction of *Dalem Mangkubumen* began in 1876 and was completed in 1877 (Widayatsari, 2002). This palace is the residence of the crown prince of Sultan Hamengkubuwono VI, whose name is KGPA Hamengkunegoro. After he was appointed king with the title Sri Sultan Hamengku Buwono VII, this palace became the residence of his younger brother, namely KGPH Mangkubumi (Yuniastuti, et al, 2014) until 1918. After the death of KGPH Mangkubumi, it was occupied by his younger brother until 1928. Since 1928, the *dalem* Mangkubumen is not inhabited, although regular maintenance is still carried out. From 1952 to 1982 it functioned as a lecture venue for several UGM faculties, which then continued 1982 until now it was used by Widya Mataram University as a lecture venue.

The settlements that emerged within the *dalem* Mangkubumen complex emerged, starting when the *dalem* Mangkubumen fully functioned as a noble residence. The nobles who live in the palace have the power to manage the palace, and even regulate who is allowed to live in the palace complex. The courtiers who served the nobleman and his family daily were allowed to stay. So some of the settlements in the *dalem* Mangkubumen are descendants of noble families or courtiers who once lived in the palace.

If you look at the layout and architecture of *Dalem Mangkubumen*, it looks the most majestic and resembles a palace. This cannot be denied because the *Delem* Mangkubumen is the residence of the future king or crown prince of the reigning king. The orientation of the palace is south-north, with 3 (three) main access doors to the palace, and there are still 2 (two) gates so that you can see two layers of security doors.

3.2 Changes in the Function of Mangkubumen

During the 3 periods experienced in Mangkubumen, adjustments occurred either by changing the function of space (transfer of functions) or by adding buildings. Period I, when it functioned as a residence

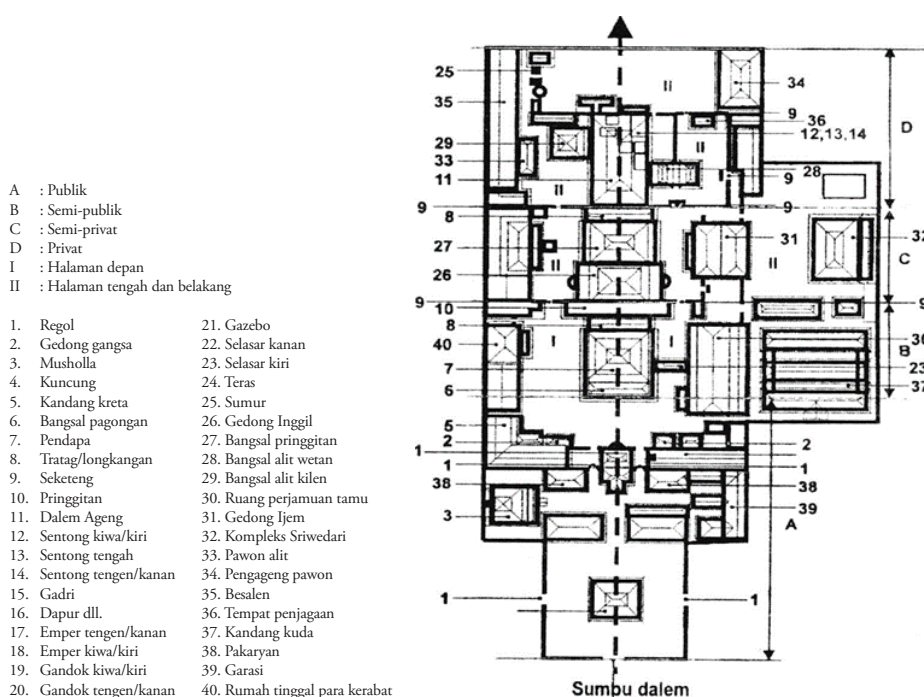


Figure 4: Layout *Dalem* Mangkubumen (Source: Widayatsari, 2002)

- | | |
|----------------------------------|--|
| A : Publik | |
| B : Semi-publik | |
| C : Semi-privat | |
| D : Privat | |
| I : Halaman depan | |
| II : Halaman tengah dan belakang | |
-
- | | |
|--------------------------|--------------------------------|
| 1. Regol | 21. Gazebo |
| 2. Gedong gangsa | 22. Selasar kanan |
| 3. Musholla | 23. Selasar kiri |
| 4. Kunciung | 24. Teras |
| 5. Kandang kreta | 25. Sumur |
| 6. Bangsal pagongan | 26. Gedong Inggil |
| 7. Pendapa | 27. Bangsal pringgitan |
| 8. Tratak/longkangan | 28. Bangsal alit wetan |
| 9. Seketeng | 29. Bangsal alit kilen |
| 10. Pringgitan | 30. Ruang perjamuan tamu |
| 11. Dalem Ageng | 31. Gedong ljem |
| 12. Sentong kiwa/kiri | 32. Kompleks Sriwedari |
| 13. Sentong tengah | 33. Pawon alit |
| 14. Sentong tengen/kanan | 34. Pengageng pawon |
| 15. Gadri | 35. Besalen |
| 16. Dapur dll. | 36. Tempat penjagaan |
| 17. Emper tengen/kanan | 37. Kandang kuda |
| 18. Emper kiwa/kiri | 38. Pakaryan |
| 19. Gandok kiwa/kiri | 39. Garasi |
| 20. Gandok tengen/kanan | 40. Rumah tinggal para kerabat |

for the king's relatives, the completeness of the Mangkubumen palace was classified as the most complete compared to other noble palaces. Divided into 6 (six) zones, namely the outer zone which functions to receive guests in general, there are important buildings, namely the Duchy Mosque and Banjar Andap. Front Zone, the zone where the crown prince entertains his chosen guests. The main building in this zone is the Pendopo Agung. The Central Zone is divided into 2 (two), namely Central Zone 1 where the crown prince sleeps and has an office, Central Zone 2 is the core of the Mangkubumen palace, because there is the Proboyekso Ward, a large building where heirlooms are placed. The back zone and service zone are used to support the daily activities of the crown prince and his relatives.

Period II was when the *Dalem* Mangkubumen was converted into an educational function, housing several faculties of Gadjah Mada University (UGM). The faculties that conducted lectures in the Mangkubumen palace were the medical faculty, and the dental faculty, therefore several buildings were converted into classrooms, laboratories, and offices. During its use, UGM built new buildings, many of which were placed in the front zone. The transition of functions for education occurs in the front zone, middle zone 1, and back zone. Meanwhile, the service area has changed into a residential area apart from several buildings in the front zone and Middle Zone 1 which have changed their function to become residential.

Period III, the *Dalem* Mangkubumen continued to function as a place of education. The difference with the previous function is that there are several different levels of education, namely elementary school and university. Not many new buildings were erected in Period III. Most of them use buildings that had been built by UGM and repurpose existing buildings. A new building was created in the back zone to meet the university's needs as a classroom. In period III, there was also a return to function according to period I, namely Pendapa Agung was reused as a reception area and hall, whereas in period II this building was given walls (semi-permanent) which were used as classrooms.

Table 1: Changes in the function of each building

Zona	Building Name	Function		
		Periode I 1874-1949	Periode II 1952-1982	Periode III 1982-sekarang
A Outer Zone	Kandang kereta barat	carriage room	classroom	classroom
	Kandang kereta timur	carriage room	classroom	classroom
	Masjid Kadipaten	prayer room	prayer room	prayer room
	Banjar Andap	guard/transit room	classroom	classroom
	Banjar Baru	open space	classroom	classroom
B Front Zone	Pendapa Agung	hall	classroom	hall
	Maosan	dining room	residence	residence
	Dapur Maosan	kitchen	residence	residence
	Gedhong Gongso Timur	storage	classroom	office
	Gedhong Gongso Barat	storage	classroom	residence
	Regol Cemeng	guard room	office	office
C Middle Zone 1	Gedong Lumuten	residence	residence	residence
	Bangsai Pringgitan	puppets room	classroom	classroom
	Keprabon	dressing room	residence	residence
	Gedong Inggil	main bedroom+office	office	rectorate
D Middle Zone 2	Bangsai Prabayeksa	weapons room	weapons room	kosong
	Bangsai Alit Kilen	playroom	-	classroom
	Bangsai Alit Wetan	jambanan	meeting room	classroom
	Mandragiri	bed room	-	classroom
E Back Zone	Besalen	weapon crafting	office	office
	Pawon Agung	kitchen	weapon crafting	residence
	Bangunan baru B	open space	open space	classroom
F Service	Keparak	residence	residence	residence
	Tamansari	bathing place	-	residence
	Bangsai Sriwedari	residence	residence	residence
	Gedhong Jaran	horse stable	clinic	classroom
	Bangunan baru C	open space	residence	residence

Based on Table 1, the function that has never changed is the duchy mosque. Meanwhile, buildings that are considered important and main, such as Bangsal Prabayekso, retained their function or were even left empty after the *Dalem Mangkubumen* became an educational function. The construction of new buildings is taking place in the front and back zones to increase the educational function space. Meanwhile, the addition of residential buildings often occurs in service zones or existing residential buildings.

3.3 Permeable Study in Mangkubumen

The ability to get from one place to another easily is the concept of permeability introduced by Kevin Lynch (1961) in Urrohmah (2023). Good connectivity of circulation can increase permeability, due to easy access and movement in a settlement Lynch (1948) in Urrohmah (2023). Permeability can also improve social and economic relations in the area. People who live in this area can easily recognize the environment and can feel the spatial hierarchy (Silavi et al., 2017).

The authority of the area and building owners influences differences in permeable levels. Differences in permeability levels are influenced by the territory of an area (Adianti, 2023). If the owner limits an area to a low level, then that area is considered more permeable. According to Altman (1975) in McCartney & Rosenvasser (2022) Boundaries or territories have a hierarchy. The hierarchy according to Altman (1975) in McCartney & Rosenvasser (2022) consists of 3 levels, while according to (Zubaidi, 2019) it was developed into 4 levels. The four territorial levels are Primary territory, Secondary Territory, Public territory, and Free territory. Through research revealed by McCartney & Rosenvasser (2022), territorial levels are explained. Areas that are classified as primary regulatory territories are still controlled by a few groups whose regulations can still be felt by other people apart from high ownership. Feelings of threat can arise in the primary territory area if there is a violation of territorial boundaries. Areas that are classified as secondary territory are areas that are periodically controlled and can be entered by other people. Areas in the public territory category are areas where other people can see and use but cannot be controlled because there are rules that are still obeyed with low ownership. Meanwhile, free territories are areas that are not owned by permanent residents or users and whose ownership is low.

Access and connectivity are concepts of permeability in a residential area. The road network in the form of main roads and village alleys can be a link in an area, with a variety of road types. Permeability allows vehicles such as motorbikes, bicycles, and pedestrians to pass through various routes to increase accessibility and connectivity (Urrohmah, 2023).



Figure 5: Accessibility functions and patterns in each period

There has been a change in the permeable level during the existence of Mangkubumen until now. Based on zones, in period I; The Central zone is the primary territory, where only courtiers and courtiers serving household activities can access this area. The front zone and back zone can be accessed by the public with permission from the house owner. Meanwhile, the outer zone can be accessed by the general public. Changes in territorial hierarchy occurred in Central Zone 1 during period II. These changes occurred in Pendapa Agung which functions as a classroom. Many changes occurred in period III, the primary territory zone occurred in the entire service zone. This is because the entire zone functions as a residential area, while the front zone to the back zone are educational areas. The outer zone remains a public area, this area combines educational functions and can be accessed by everyone without having to have an interest in Mangkubumen.

As a result of changes in function, it also affects the pattern of accessibility types. Period I is divided into 3 types, namely the outer zone which can be accessed by the public because in this area there is a mosque as a place of worship for people who live in Mangkubumen and the surrounding community. The front zone and middle zone 1 are areas that can be accessed by vehicles (at that time in the form of horse-drawn carriages) because guests of the house owner can easily enter these two areas. This is because in this area there is a grand pendapa, Maosan (dining room), and Gedong hinggil (office), which are buildings to accommodate the activities of the owner of the palace and his guests. Middle Zone 2, back zone, and service can only be accessed on foot. Areas that can only be accessed on foot are the most private areas because only the owner and servants are there

Period II still has similarities with Period I, even though the *Dalem* Mangkubumen has changed its function to an educational function. The addition and change of function of space to support educational functions still predominantly occurs in the outer zone and outside zone, front zone, and Middle zone 1. Period III saw a change in accessibility patterns, Middle Zone 2 which was initially only accessible by pedestrians. Changed to being accessible by motorized vehicles due to the establishment of a new classroom in the rear zone area. The service zone as a whole can only be accessed by pedestrians, making the area have a primary territory hierarchy.

4. Conclusion

Based on the study, the permeability in Mangkubumen is divided into 3 (three) periods. Period I when it still functions as a residence as a whole, Period II when it functions as an educational function (several UGM faculties), and Period III functions as an educational function (Widya Mataram University and Growing Elementary School). As a result of this change in function, there was a change in function of the building and additions to the building. The transfer of functions initially occurred in the outer zone, front zone, middle zone 1, and back zone. However, in period III, function transfer occurred in all zones. Many building additions occurred in the front zone, back zone, and service zone.

The level of permeability is in line with the change of function and addition of buildings in each zone in each period. The change in function to a social function (education), disturbed the palace, whose original function was as a noble house. Primary territory zones occur in residential areas although overall the interior functions as a social function. Areas that can only be accessed on foot show how people who live in these areas do not want to be disturbed by vehicle movements, in other words, only people who are interested and familiar with the area can access them.

5. References

Adianti.I (2019) Tipologi Tata Ruang Rumah Bangsawan di *Dalam* Baluwarti Kraton Yogyakarta, Berdasarkan Gelar Kebangsawanan, *Jurnal Arsitektur Pendapa*, 2(1), 35-44

- Adianti, I., Ikaputra & Rahmi, D.H (2023) Spatial Permeability in Kraton Yogyakarta, Indonesia During The HB IX-HB X Periods, ISVS E-Journal, 10(9)
- Altman, I. (1975). *The Environment And Social Behaviour: Privacy, Personal Space, Territory, Crowding.* Brooks/Cole Publishing Company
- Lynch, K. (1961). *The Image of the City.* Harvard: MIT Press.
- Lynch, K. (1984). *Good City Form.* Harvard: The MIT Press.
- Mccartney,S & Rosenvasser,X., (2022), *Privacy Territories in Student University Housing Design: Introduction of The Hierarchy of Isolation and Privacy in Architecture Tool (HIPAT,* Sage Open
- Roem, M., Lubis, M., Mochtar, K. & Maimoen, S. (2011) *Takhta untuk Rakyat: Celah-Celah Kehidupan Sultan Hamengku Buwono IX,* Jakarta: Gramedia
- Rossini, F., Roca, E. & Harris, S. (2018) *The Notion Of Ground: A Definition of Urban Permeability in Hong Kong and Barcelona,* Ace: Architecture, City and Environment Arquitectura, Ciudad Y Entorno, 13 (38): 211-234
- Silavi, T., Farshad, H., Christophe, C., Farshad, N. (2017). *The Legibility and Permeability of Cities: Examining the Role of Spatial Data and Metrics.* ISPRS International Journal of Geo-Information, 6(101): 1-20
- Urrohmah, A., Ellisa, E., & Fuad, A. H. (2023). *The Concept of Permeability on The Neighbourhood Scale,* CSID Journal of Infrastructure Development, 6(1). <https://doi.org/10.7454/jid.v6.i1.1076>
- Widayatsari S., (2002), *Tata Ruang Rumah Bangsawan Yogyakarta,* Jurnal Dimensi Teknik Arsitektur Vol. 30, No. 2: 122 – 132
- Yuniastuti T., dkk (2014) *Mengungkap Sejarah Arsitektur Dalem Mangkubumen Yogyakarta Periode Tahun 1974-1949,* Simposium Nasional RAPI XIII
- Yuniastuti T., Wibowo S., (2022), *Perubahan Bentuk Bangunan Dalem Mangkubumen Yogyakarta,* Yogyakarta:Deepublish
- Yuniastuti, T., & Murti, D. A. K. (2019). *Pengaruh Perubahan Fungsi Bangunan pada Bentuk Bangunan Bangsal Banjar Andhap Dalem Mangkubumen Yogyakarta.* Jurnal Arsitektur Pendapa, 2(1), 20–34.
- Zubaidi, F., (2019); *Types and Patterns of Territory in The Traditional Settlement of Ngata Toro,* Architecture ENVIRONMENT, 18 (2)