Criteria of campus exterior spaces in Central Java

M K Akbar*, D Nurgandarum and K Lahji

Architecture Department, Faculty of Civil Engineering and Planning, Universitas Trisakti, Indonesia

* Muthiah052001600045@std.trisakti.ac.id

Abstract. This paper explores harmonious exterior spaces with its surrounding through contextual architecture. With case studies of Diponegoro University area in Central Java, Indonesia. Diponegoro University area consists of various functions of building complex, hence the exterior spaces criteria are disparate. However, there are no exterior spaces criteria contextual with Diponegoro University area. To solve the problems, this study suggested the following strategies, starting with precedent studies and analysis to identify exterior spaces criteria. Variables in the precedent study are sampled from several complex functions of buildings, namely: complex area of office function, educational function, multipurpose building function, mosque function. Precedent studies and analysis will generate general and specific exterior spaces criteria harmonious with its surrounding and related to the characteristics of each building. Tropical climate and topographic contours are also concerns in formulating general criteria based on campus location. Specific criteria are inferred according to the building based on its function. The result of this paper can be utilized as guideline to designing harmonious exterior spaces. This paper presents exemplary results showing that exterior spaces criteria divided into general and specific criteria.

1. Introduction

Designing a building requires process ranging from finding design criteria, programmatic concepts, schematic design and synthesize schematic design into building design. The process starts with selecting the design criteria. Design criteria require design elements to decide each criteria for every detailed and targeted design aspects. Design element used in this paper is based on the book "Design Juries on Trial, The Renaissance of The Design Studio" [1]. The element that will be explored is the site development element. Site development element is further divided into several aspects, one of them is the exterior spaces aspect.

Exterior spaces are crucial to produce a good design because it promote individual need satisfaction as well as societal benefits such as: democratic engagement, opportunities for leisure activities and livelihood generation [2], social interaction, relaxation, restoration and contact with nature [3]. To produce detailed exterior spaces criteria require its own exterior spaces elements. Important elements of exterior spaces are thermal comfort [4], utilizing topography [5], plaza with hard elements [6], exterior stair and ramp, garden bench, street light, parking facilities [6]. Surrounding environment is also one of the aspects considered to determine the design element of exterior spaces. Therefore, it is necessary to have unity aspect between the environment and building complex harmoniously with each other. Harmony with the surrounding environment can be resolved with a contextual approach.
In Architecture, context involves a special relationship between the building and its surroundings, as well as the relationship between the building and its physical and non-physical environment [7]. The contextual approach aims to produce unity between exterior spaces and its environment. This can be accomplished through the harmony characteristics. Physical aspects of harmony characteristics can be produced in a way, take the same basic form but rearrange it so that it looks different, use the same material and repeat the environment patterns. Thus the presence of one or a group of new buildings is more supportive than rivaling the character of existing buildings [7].

Exterior spaces criteria analyzed in this paper are Diponegoro University exterior spaces in Semarang, Central Java, Indonesia. Tropical climate on campus and contour topography is also a concern in determining exterior spaces criteria. However, there are no exterior spaces criteria for different building functions contextual with Diponegoro University area. The purpose of this paper is to identify general criteria and specific criteria harmonious with its surrounding and related to the characteristics of each building.

2. Methods
This paper is intended to explore or identify the overall character of the exterior spaces design of Diponegoro University area, that can be utilized as guideline to designing harmonious exterior spaces. Research is conducted by comparing the exterior spaces of several complex buildings with different functions of Diponegoro University area. In this study, the whole campus can be divided in several complexes and called as complex function, namely: complex area of office function, educational function, multipurpose building function, mosque function.

To solve the problem, this paper suggested the following strategies, starting with precedent studies and analysis to identify exterior spaces criteria. Research samples consist of: rectorate of Diponegoro University, Diponegoro national hospital, Diponegoro University mosque complex, auditorium of FISIP, dean of the faculty of psychology, urban and regional planning department building, faculty of medicine, faculty of social and political sciences, faculty of animal husbandry and agriculture, faculty of electrical engineering. Research sample as secondary data obtained through photos from google earth. Exterior spaces design for each sample is compared and identified with exterior spaces design elements. Literature studies are conducted to obtain criteria for educational buildings, offices, mosques and multipurpose buildings. The conclusion of the precedent study and analysis becomes general and specific exterior spaces criteria.

3. Results and discussion
The discussion began by looking at the context of Diponegoro University area, which is intended for educational areas. Each building needs an exterior spaces that is contextual with its function and environment. Diponegoro University has contoured land however, the land in some of the building complexes within the area are leveled so that the contoured areas only on the exterior spaces (see figure 1).
The precedent study will compare some of the functions of buildings in Diponegoro University area that will be used as variables. The result of this precedent study is a specific criteria for each building function and general criteria for exterior spaces that is contextual to its environment.

**Table 1.** Describes a study precedent with a comparison of exterior spaces element elements. Variables in the precedent study are buildings with multipurpose building functions, offices and mosques.

| Exterior Spaces Element | 1. Diponegoro University Rectorate | 2. Diponegoro National Hospital | 3. University Diponegoro Mosque | 4. Auditorium Of Faculty Of Fisheries & Marine Sciences | 5. Dean Of The Faculty Of Psychology |
|-------------------------|-----------------------------------|--------------------------------|-------------------------------|--------------------------------------------------------|---------------------------------------|
| Thermal Comfort[4]      | Thermal comfort obtained from shadow of the tree. | Thermal comfort obtained from shadow of the tree. | Thermal comfort obtained from shadow of the tree. | Thermal comfort obtained from shadow of the tree. | Thermal comfort obtained from shadow of the tree. |
| Utilizing Topography[5]  | Utilizing topography by forming circulation to assert the building hierarchy. | Not available, because the exterior spaces area does not have a significant contour. | Utilizing topography by forming circulation to assert the building hierarchy. | Not available, because the exterior spaces area does not have a significant contour. | Not available, because the exterior spaces area does not have a significant contour. |
| Plaza With Hard Elements[6] | The plaza location is on the central axis of building layout. The plaza used grey color conblock material. | The plaza location is on the central axis of building layout. The plaza used stone and casting material. | The plaza location is on the central axis of building layout. The plaza used ceramic with square patterns material. | Not available | Not available |
| Exterior Stairs and Ramp[6] | Car ramp and exterior stairs is a response from contour grounds. | Not available | Ramp for disabled and exterior stairs lead to building entrance are available. | Car ramp and exterior stairs is a response from contour grounds. | Ramp for disabled and exterior stairs lead to building entrance are available. |
| Garden Bench[6]         | Not available | A bench with shading are available. Bench position on the plaza side. | Not available | Not available | Not available |
| Street Lighting[6]      | Solar Powered street Lights are available. | Solar Powered street Lights are available. | Solar Powered street Lights are available. | Not available | Not available |
| Parking Facilities[6]   | Outdoor parking is next to the building. The Material used gray conblock. Tree shading available. | Outdoor parking in the front of the building. The Material used gray conblock. Tree shading available. | Outdoor parking in the left side of the building. The Material used gray conblock. Tree shading available. | Outdoor parking in the right and left side of the building. The Material used gray conblock. Tree shading available. | Outdoor parking in the right and left side of the building. The Material used gray conblock. Tree shading available. |
Table 2. Describes a study precedent with a comparison of exterior spaces element elements. Variables in the Precedent Study are buildings with educational building functions.

| Exterior Spaces Element | 6. Urban and Regional Planning Department | 7. Faculty of Medicine | 8. Faculty of Social and Political Sciences | 9. Faculty of Animal Husbandry and Agriculture | 10. Electrical Engineering Building |
|-------------------------|------------------------------------------|-----------------------|--------------------------------------------|---------------------------------------------|----------------------------------|
| Thermal Comfort[4]      | Thermal comfort obtained from shadow of the tree. | Canopy drop off area are available. Thermal comfort obtained from shadow of the tree. | Canopy drop off area are available. | Canopy drop off area are available. | Canopy drop off area are available. Thermal comfort obtained from shadow of the tree. |
| Utilizing Topography[5] | Not available, because the exterior spaces area does not have a significant contour. | Utilizing topography by forming circulation to assert the building hierarchy. | Not available | Not available | Not available, because the exterior spaces area does not have a significant contour. |
| Plaza With Hard Elements [6] | The plaza location is on the central axis of building layout. The plaza used grey color conblock material. | Not available | Not available | Not available | Not available |
| Exterior Stairs and Ramp [6] | Not available | Car ramp and exterior stairs is a response from contour grounds. Exterior stairs lead to building entrance are available. | Car ramp and exterior stairs is a response from contour grounds. Exterior stairs lead to building entrance are available. | Exterior stairs lead to building entrance are available. | Exterior stairs lead to building entrance are available. |
| Garden Bench[6] | A bench with shading are available. Bench position on the plaza sale. | Not available | A bench with shading are available. | A bench with shading are available. | A bench with shading are available. |
| Street Lighting [6] | Solar Powered street Lights are available. | Solar Powered street Lights are available. | Solar Powered street Lights are available. | Solar Powered street Lights are available. | Solar Powered street Lights are available. |
| Parking Facilities[6] | Outdoor parking in the front of the building. Motorcycle outdoor parking in the left and right side of the building. Material used gray conblock. | The outdoor parking area is in the middle as a response form U-shaped building. Material used gray conblock. Tree shading available. | Outdoor parking in the front of the building. The Material used gray conblock. Tree shading available. | Outdoor parking in the front of the building. The Material used gray conblock. Tree shading available. | Outdoor parking in the front of the building. The Material used gray conblock. Tree shading available. |

Discussion of precedent study refers to table 1 and table 2. Result found that every exterior spaces element with different building functions produces similar and different exterior spaces criteria. This is because the variable study precedent comes from the same area, namely Diponegoro University area. Elements with the same criteria become general criteria of exterior spaces design that can be used as a reference for designing exterior spaces. Tropical architectural characteristics become additional characteristics to maximize general criteria of exterior spaces design. If it did not create a well-tempered environment, it could not succeed as a social enabler then exterior spaces will need for provision of more passive cooling utilizing shading through vegetation [8]. The importance of vegetation such as urban trees are provide shading, something pleasant to look at, and contrasting the ‘fresh and clean’ air of the exterior spaces to the busy and noisy street environments [2]. Exterior spaces layout related to sustainability also pays attention to the contours of topography. General criteria of exterior spaces design is as follows:

- Provides a plaza located on the axis of the building using conblocks and or stones material. The plaza serves for gathering activities, ceremonies, outdoor events.
- Providing guardrail as a complex barrier or between buildings according needs and building composition.
- Provides a bench on the side-lines of the plaza, green lanes, pedestrians, and scattered trails, shading required. Provides lamp with solar power.
- Provides ramp on each floor difference for people with disabilities and the elderly.
- Parking, drop off area, entrance are adjacent. Canopy in drop area are available. The material used on the parking lot are grey conblock.
• Provide ramp for car in accordance with the topographical contours or according to building functions and needs.

![Figure 2](image)

Figure 2. (A) Provides a retaining wall for topography differences, (B) Provide an outer staircase on each ground height difference, (C) Utilizing topography by forming circulation to assert the building hierarchy.

Meanwhile, the different elements between building functions are compared to the exterior spaces criteria of each function. The difference in exterior spaces criteria is due to differences in building functions based on study precedents variable. Building with multipurpose function, additional exterior spaces criteria are easy, safe and convenient facilities and accessibility available for people with disabilities and the elderly throughout the venues spaces and facilities, the venue has a parking area that can be functioned as loading and unloading of goods located close to the exhibition area [9], there is a drainage system leading to city waterways, parking area is near the entrance and drop off area near the entrance and drop off area [10].

Building with office function, additional exterior spaces criteria are functioning green area helps to reduce heat and creates a comfortable atmosphere, open spaces as a gathering place should be easily accessible physically and visually, with disabled facilities included [11], vegetation such as flowers and trees as an enforcement of corridor layout [12], open spaces as connectors between buildings, commercial areas, parks, etc., open spaces supporting facilities [13].

Building with educational function, additional exterior spaces criteria are outdoor spaces utilization for learning activities does not interfere with the original environment, the green open spaces can absorb rainwater [14], provide a gathering spaces to add a sense of community and individuality of students, adapting favorable climatic conditions and minimizing interference [15]. Building with mosque function, additional exterior spaces criteria are wide yard for widening when the prayer room is full or for religious event, used material for exterior spaces should not absorb heat, provide a difference in the floor surface height from outside spaces to indoor spaces, provide an exterior spaces between buildings and highways to keep dust and dirt in, provides a fence filter to avoid noise, pond as a symbol of chastity and point of view, vegetation needed for shade, the highest floor hierarchy is the floor of the mosque, yard or garden, then the highway or surrounding environment [16].

4. Conclusion

Exterior spaces criteria obtained from study precedent and literature study. The criteria produced by this paper are general criteria and specific criteria harmonious with its surrounding and related to the characteristics of each building. General criteria of exterior spaces design is as follows:

• Provides a plaza located on the axis of the building using conblocks and or stones material. The plaza serves for gathering activities, ceremonies, outdoor events.
• Providing guardrail as a complex barrier or between buildings according needs and building composition.
Provides a bench on the side-lines of the plaza, Green lanes, pedestrians, and scattered trails, shading required. Provides lamp with solar power.

Provides ramp on each floor difference for people with disabilities and the elderly.

Parking, drop off area, entrance are adjacent. Canopy in drop area are available. The material used on the parking lot are grey conblock.

Provide ramp for car in accordance with the topographical contours or according to building functions and needs.

**Figure 3.** (A) Provides a retaining wall for topography differences, (B) Provide an outer staircase on each ground height difference, (C) Utilizing topography by forming a mutated circulation and trap to assert the building hierarchy.

Specific criteria of exterior spaces design are divided by building function based on study precedents variable. Multipurpose building exterior spaces criteria is as follows: easy, safe and convenient facilities and accessibility available for people with disabilities and the elderly throughout the venue's spaces and facilities, the venue has a parking area that can be functioned as loading and unloading of goods located close to the exhibition area, there is a drainage system leading to city waterways, parking area is near the entrance and drop off area near the entrance and drop off area.

Office building exterior spaces criteria is as follows: functioning green area helps to reduce heat and creates a comfortable atmosphere, open spaces as a gathering place should be easily accessible physically and visually, with disabled facilities included, open spaces as connectors between buildings, commercial areas, parks, etc., open spaces supporting facilities, vegetation such as flowers and trees as an enforcement of corridor layout.

Education building exterior spaces criteria is as follows: outdoor spaces utilization for learning activities does not interfere with the original environment, the green open spaces can absorb rainwater, provide a gathering spaces to add a sense of community and individuality of students, adapting favorable climatic conditions and minimizing interference.

Mosque exterior spaces criteria is as follows: wide yard for widening when the prayer room is full or for religious event, used material for exterior spaces should not absorb heat, provide a difference in the floor surface height from outside spaces to indoor spaces, provide an exterior spaces between buildings and highways to keep dust and dirt in, provides a fence filter to avoid noise, pond as a symbol of chastity and point of view, vegetation needed for shade, the highest floor hierarchy is the floor of the mosque, yard or garden, then the highway or surrounding environment.

**References**

[1] Malecha M J and Anthony K H 1993 *Design Juries on Trial: The Renaissance of the Design Studio*

[2] Sahakian M, Anantharaman M, Di Giulio A, Saloma C, Zhang D, Khanna R, Narasimalu S, Favis A M, Alfiler C A, Narayanan S, Gao X and Li C 2020 Green public spaces in the cities of South and Southeast Asia. Protecting needs towards sustainable well-being *J. Public Sp.* 5 89–110

[3] Abbasi A, Alalouch C and Bramley G 2016 Open Space Quality in Deprived Urban Areas: User Perspective and Use Pattern *Procedia - Soc. Behav. Sci.* 216 194–205

[4] Saroinsong F B and Kalangi J I 2017 Dengan Indeks Disc Redesign Unsrat Campus Greenspace Regarding To Evaluation Of *23* 62–76

[5] Pawitro U, Nitya A, Septiandi T and Hernomo A 2014 Kajian Ekspresi Ruang Luar dan Ruang
Dalam pada Bangunan Masjid Al – Irsyad Kota Baru Parahyangan Ditinjau Dari Sustainable Design Reka Karsa 2 1–12

[6] Elviana E and Suryani S Elemen Pembentuk Ruang Terbuka Di Lingkungan Perumahan Sederhana ENVIROTEK 8

[7] Widati T 2015 Pendekatan Kontekstual dalam Arsitektur Frank Lloyd Wright J. Perspekt. Arsit. 10 38–44

[8] Bay J-H 2004 Sustainable community and environment in tropical Singapore high-rise housing: the case of Bedok Court condominium Environ. Des. 8 333

[9] Anon 2017 Peraturan Menteri Pariwisata Republik Indonesia Nomor 2 Tahun 2017. (2017). Pedoman Tempat Penyelenggaraan Kegiatan (Venue) Pertemuan, Perjalanan Insentif, Konvensi Dan Pameran. Menteri Pariwisata Republik Indones.

[10] Yasir A, Sastika A and Supriyono 2017 Perencanaan dan Perancangan Gedung Convention Centre di Kabupaten Penukal Abab Lematang Ilir (PALI) Tekno Glob. 6

[11] Reynaldo Ilianto F 2019 Perancangan kantor bisnis rintisan milenial di kramat pela J. STUP Sains, Teknol. Urban, Perancangan, Arsit. 1 1401–12

[12] Permana A Y, Permana A F S and Andriyana D 2020 Konfigurasi Ruang Berdasarkan Kualitas Konektivitas Ruangan Dalam Perancangan Kantor: Space Syntax Analysis J. Arsit. Zo. 3 155–70

[13] Hasibuan F and Siwi S H 2019 Implementasi Architecture For All Pada Pemanfaatan Ruang Terbuka Hijau Sebagai Ruang Tunggu Di Kantor Pemerintahan J. Bakti Masy. Indones. 2 135–44

[14] Hapsari O E 2018 Analisis Penerapan Green Building Pada Bangunan Pendidikan (Studi Kasus : Green School Bali) Al-Ard J. Tek. Lingkung. 3 54–61

[15] Virgoayu D A, Gandarum D N, Walaretina R, Arsitektur M J, Arsitektur C J, Konsep T, Ikonik M and Modern K 2018 Pencerminan Konsep Modern Ikonik Pada Fasad Arsitektur Bangunan Pendidikan Semin. Nas. Cendekiawan 4 199–205

[16] Moh. Arsyad Bahar 2012 Evaluasi Terhadap Aspek Kebersihan Dan Kesucian Dalam Perancangan Arsitektur Masjid J. Islam. Archit. 2 36–45