

POROSITY ARCHITECTURE IN ECOLOGICAL DESIGN

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Specially dedicated to my beloved family and friends.

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ABSTRACT

In many cities, *porosity architecture* is often scripted by positioning of ‘best practices’. *Porosity architecture* is an in-depth analysis from both theoretical and practical perspectives that shows how ambiguous architecture is and purposely offers “uncertain” physical responses to deal with issues related to city’s fast-paced development and lifestyle. However, it is only developed in urban approach where it includes the horizon or boundary between public and private space. The purpose of this dissertation is to identify design strategies of *porosity architecture* in ecological aspect. The argument is supported through subject related literature review and case study research. Three major elements of *porosity architecture* have been determined as direct adoption in ecological approach. This study investigates the three main principles: sponge metaphor, permeability and transparency. The research then further scopes down to permeability and its characteristic along with specific nature as the mean of manifestation for *porosity architecture* in ecological design with the use of selected case studies. The findings show that the *porosity architecture* can be an alternative design strategy for ecological design. This dissertation has concluded that there is a serious effort needed for the development of *porosity architecture* on ecological approach.

ABSTRAK

Di kebanyakan bandar, seni bina berkeliangan (*porosity architecture*) sering disebut sebagai 'kaedah terbaik'. *Seni bina berkeliangan* merupakan analisis yang mendalami teori dan praktikal iaitu dengan menerangkan bagaimana seni bina yang samar-samar dan secara tidak sengaja dapat menawarkan imej 'tidak tentu' sebagai tindak balas fizikal untuk mengatasi isu-isu kepesatan bandar dan gaya hidup di pusat bandar. Walau bagaimanapun, pendekatan ini dibangunkan di bandar hanya sekadar untuk merangkumi pendekatan secara terbuka dan telus di antara ruang awam dan ruang persendirian sahaja. Disertasi ini bertujuan untuk mengenal pasti strategi reka bentuk *seni bina berkeliangan* dalam aspek ekologi. Hujah ini disokong melalui subjek yang berkaitan dengan kajian literatur dan penyelidikan kajian kes. Tiga elemen utama *seni bina berkeliangan* telah ditentukan secara langsung dalam pendekatan secara ekologi. Tiga unsur utama yang dikaji adalah metafora span, kebolehtelapan dan ketelusan. Maka, kajian ini memberi tumpuan lebih kepada ketelusan *seni bina berkeliangan*, prinsip dan asas umumnya seperti dalam bentuk ekspresi secara ekologi dengan menggunakan kajian-kajian kes tertentu. Hasil kajian menunjukkan bahawa *seni bina berkeliangan* boleh menjadi salah satu reka bentuk alternatif untuk reka bentuk ekologi. Kesimpulan daripada disertasi ini telah menunjukkan bahawa usaha-usaha yang serius perlu dilakukan bagi membangunkan seni bina berkeliangan dalam pendekatan secara ekologi.

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CHAPTER 1

INTRODUCTION

1.1 Research Background

The title implies ecological or “green” issues in current days and the way the issues influence the new architecture; while on the other hand, the term ‘*porosity architecture*’, as used by Steven Holl during his project, suggests a green past that could have relevancy to the present (Kotsopoulos, 2008). Thus, this is a quest concerning the origins and development of modern ecologically conscious architecture. However, it does not look back to indigenous and other precedents from far behind where some people might expect it does. 20th century has exponentially abused the biosphere to the endangerment of natural eco-system (Porteous, 2002, p. 47).

The impact of development has vested awareness in the world to change conventional development to be more liable and environment-friendly. Hence, *porosity architecture* was inaugurated by Architect Steven Holl in his project in order to increase awareness and permeability to the environment (Holl S. , 2000). However, Holl’s main approach on *porosity architecture* is focusing on urban planning rather than ecological design. Although *porosity architecture* is a subset to the ecologically sustainable development, the impact on the development is still needed to be taken into account (Abidin, 2009). Therefore, this dissertation aims to seek for the design strategies of *porosity architecture* that can be applied in ecological design.

1.2 Problem Statement

Architecture in the last decade had tried to be reassuring, rational, reasonable, but it seemed out of joint with the time. Artificially constructed landscapes has inspired pioneer relationship with ecology (Papadakis, 1992, p. 12). The theory of *porosity architecture* which was then re-interpreted by Architect Steven Holl has arose his new design concept towards urban context (Kotsopoulos, 2007). It is a new theory emerged to be the platform for everything to be apprehended together. Now, *porosity* has been the world leading concept to achieve balance between long-term economic with environment and social health. However, this theory has only been developed in term of urban approach.

Besides that, it was found that there are some research gaps on the theory of *porosity architecture* from several literatures. Various interpretation and effort being put into this theory are based on human behavioural study which shows a lot focuses on social and urban development only. Even though the famous urbanism Architect Steven Holl mentioned about the ecological approach of *porosity architecture*, there is still insufficient concern on environment and ecology (Holl S. , 2000).

Endless possibilities for new development can be achieved when there are more studies done for the subject of *porosity architecture* in ecological aspect. Critical call to attention on the challenge to create ecological, environmental and sustainable architectural responses as well as the outcome to current social and political situations, ensuring their longevity beyond their rapid construction. The world is still expecting their long-term viability and ecological soundness in anticipation (M.A.Yadav, 2009). Although it provides a unique realm for development, entailing social, recreational and environmental benefits as well as serving political and economic interests, the potential for synergy between the built environment and ecology needs to undergo a complex and integrated process, with mindful strategies, a substantial investment of time, money and above all research and design development (Ryan, 2010). Thus, it was decided to study on how *porosity architecture* can be adopted in ecological design through case studies.

1.3 Research Aim and Objectives

The aim of this dissertation is to identify different design strategies of *porosity architecture* that can be applied in ecological design. This dissertation is originated from the Design Thesis. At the end of the study, it can help to formulate the overview of the Design Thesis and enrich the understanding on certain aspects. The following objectives have been identified in order to achieve the aim:

- i) To investigate the characteristic and specific nature of *porosity architecture*.
- ii) To identify the general principles of *porosity architecture*.
- iii) To examine the means of manifestation of *porosity architecture* in ecological design with the use of selected case studies.

1.4 Research Questions

This dissertation looks into the following questions:-

- i) What are the characteristic and specific natures of *porosity architecture*?
- ii) What are the general principles of *porosity architecture*?
- iii) How can these new design strategies be adopted in ecological design?

1.5 Significance of Studies

This research was delimited to the preparation, implementation, and evaluation of *porosity architecture*. The research was confined to get responses from case study on ecological and environmental aspects. The research will be helpful to the architectural and construction industries through informing them in the aspect of ecologically sustainable development. It can also serve as a future reference for researchers on the subject of *porosity architecture* in tropical country. At the same time, it opens up new opportunities for researcher to develop this concept to other parts of the world with respect to their climate conditions. Most importantly, the research will raise public awareness on the importance of ecologically sustainable development.

1.6 Research Scope

This dissertation focuses on the case studies and theories of *porosity architecture*. Selected case studies for *porosity architecture* are worldwide and limited to the Architect Steve Holl's creation only. Case studies that were selected for further interpretation focus only on tropical countries because it was intended to link this theory to the design thesis which is sited at Malaysia. However, the design strategies of the *porosity architecture* assessed in this research are limited to the following parameters: transparency, sponge metaphor and permeability of the design. Author decides to focus on permeability as the main principle and characteristic of *porosity architecture* as there is insufficient literature and reading on permeability principle that has been published or discussed by other researcher so far. Therefore, the case study will focus more on permeability approach in tropical countries. Tree house by Vo Trong Nghia Architects, green school Bali and The Interlace by architect OMA have been assessed to demonstrate how *porosity architecture* is adopted in ecological design.

1.7 Flow of Research Methodology

The research is initiated by the investigation of issue and problem together with the aim and objectives. The scope and significance of study are then identified. The research is done by collecting data and information through literature review. Secondary data becomes the main source of information which includes journal article, books, proceeding and website from related field. For the data collection in *porosity* strategies, the data is obtained through case studies research. After the data has been analysed, new design strategies of *porosity architecture* will be identified. The flow of the methodology is as shown in Figure 1.1.

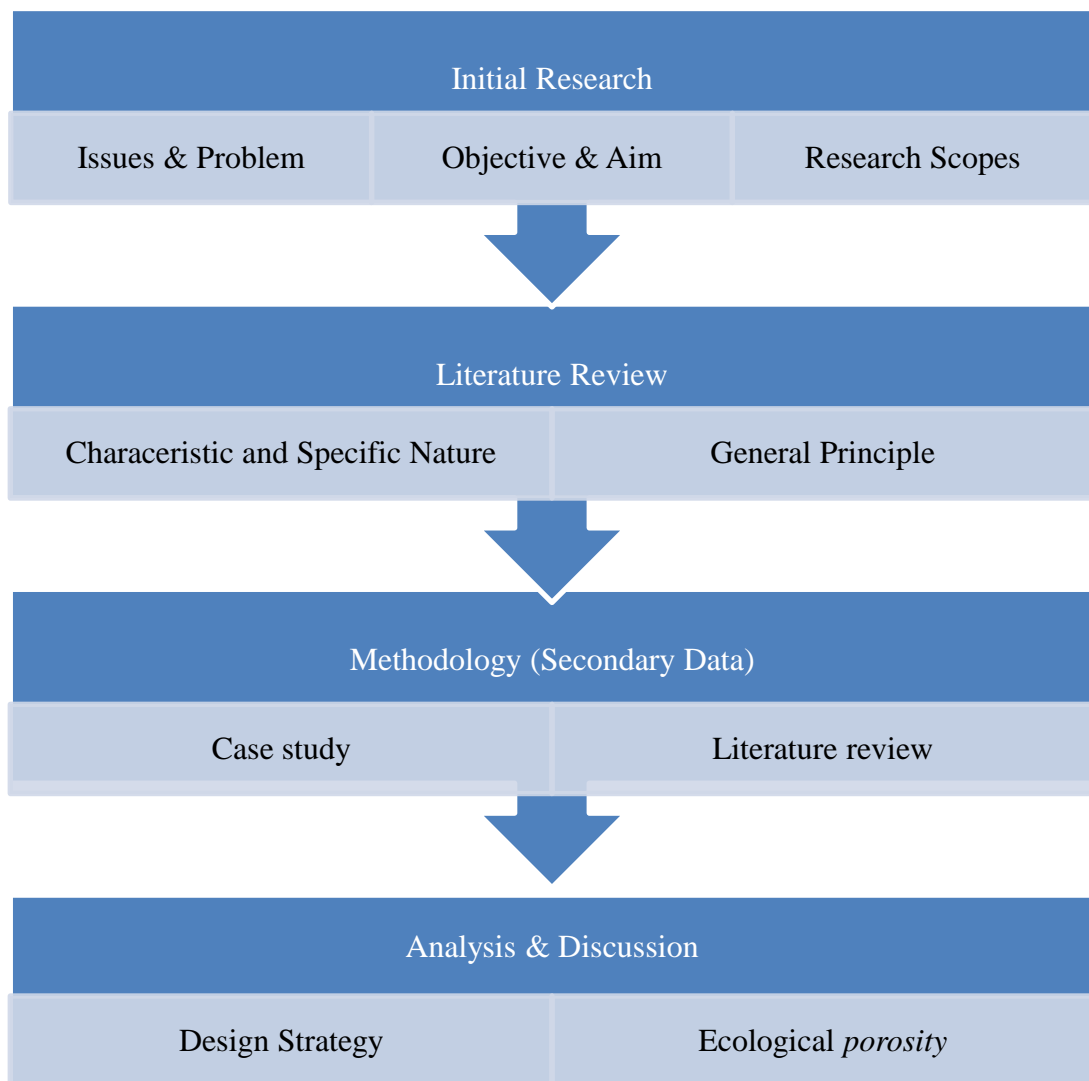


Figure 1.1 Flow chart of research methodology

1.8 Expected Findings

In this study, there are three main objectives which lead into the understanding of *porosity architecture* in ecologically sustainable development.

The first expected finding yields the characteristics and specific natures of *porosity architecture*. It is important in order to understand the ideas and principle behind the theory of *porosity architecture* which has been widely applied in other countries.

The second finding identifies the general principle of *porosity architecture*. This finding will enable the designer or architect to understand and discover the relationship between the design element and the theory of *porosity architecture*.

The third finding outlines the means of manifestation of *porosity architecture* in ecological design. Through this finding, strategy will be implemented into the design thesis proposal in order to achieve ecological friendly design. Moreover, this finding will also enable the building owner or developer to be alerted on the steps to be taken in order to achieve ecological sustainability. However, further considerations need to be made to address the loopholes of *porosity architecture*.

1.9 Structure of Dissertation

The dissertation is classified into five chapters in overall where the first chapter intend to deliver overall image of the dissertation. It includes research background, problem statements, research objectives, research questions, significance of studies, research scope, flow of research methodology and expected findings of the dissertation.

Second chapter presents a series of readings which are related to the understanding of *porosity architecture*. This includes the definition, specific nature,

characteristic, general principle of *porosity architecture* and other relevant information that can support the dissertation.

Third Chapter discusses the research strategy which includes multiple-case studies on general principle and characteristic of *porosity architecture*; discussion on case studies; and the framework of research. The research procedure of the case study in term of data collection, data recording and basic for case study selection also will be explained in this chapter.

Fourth chapter comprises data of the dissertation from interview and literature review. In this chapter, data is collected for the analysis from case studies. The analysis and synthesis of the data will be discussed at the end of the chapter. Meanwhile, the finding will be further evaluated in order to answer the research aim and objectives that stated in the first chapter.

Fifth chapter is the summary of research according to the overall studies and analysis. This chapter will also present the limitation and recommendation of the research for further study.

1.10 Summary

This study is an interpretation of architecture theory from other researches and it focuses specially on ecological design. Prior to this chapter, we can realize author's views and thoughts on architecture which is not only about the space design but also the consciousness of relationship between human with ecology and environment. This presents an alternative in providing an ecological design, not only developing a new character for the city but also helps to engage the community back to the nature.

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