

A Contextual Theory and Application of Eco-Interior In Indonesia

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Abstract: The design with environmental friendly approach or ecological approach regarded as one of methods in design area to respond the environmental degradation issue. Interior design with ecological approach called as eco-interior. How is the eco-interior approach understood as conceptual theory and applied practically on the concrete object of building space became problem in this research. The study of contextual eco-interior theory and application in Indonesia was conducted to obtain the concrete representation regarding the understanding of eco-interior theory and application has been conducted contextually in Indonesia. The qualitative method in this research was conducted by phases of: theoretical problem, idea diagnosis and argumentation, practical views exploration, objects exploration and evaluation, and conclusion. The design objects that were designed with the environmental insight orientation were represented as model. The research results were in the form of the classification and comparison of eco-interior application on each of study objects. The classification indicated the applied aspect have been sought maximally (as the design focus) and have not been applied maximally (the traces of architectural design).

Key words: eco-interior, space organization, material, lighting, ventilation, sanitation, pollution, emission, waste management

INTRODUCTION

The implication of sustainable development of Our Common Future published by the Brundland Commission (1987), generally, was: “*development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*” In the understanding phase the concept and implementation of sustainable development, needed the adaptation suitable with the ecological, social, and economical contexts on each of place settings. Generally, the ecological conditions in Indonesia have the specific characteristics need to consider in order being able to implement the sustainable development concept more optimally. Ecological characteristics Indonesia has related to the sustainable development efforts in Indonesia are abstracted from several sources as follow: Indonesia has humid tropical climate as a consequence of geographically location. The cases will very influence the ecological pattern and system taking place both as macro and micro. The availability of its natural resources type, characteristic, and potential will also highly influence every developmental application.

The modern developmental advance had effect on the cultural and societal life pattern changes, included the demand on the design project suitable with the modern life pattern. In the traditional development (with traditional settlement environmental setting), the application still can natural and simple in its characteristic. In the modern development, needed the applied strategy suitable with both material and structural technological advance. Need for space and space conditioning become very large to support productivity of activity carried out in the space. There are several modern buildings in Indonesia, particularly in Java that have applied the environmental (ecological) friendly approach in their designs. The efforts are the concrete actions as a part in the efforts to build balance between human, space, and environment. The buildings are the concern shapes of the designer and the building owner institution to the environmental balance (macro) and space-human (micro). The concern to the balance between human-space-environment demanded the large attention consequence to the design decisions applied. Due to every design decision taken will result in the interrelationship (both impacts and benefits) between the three (human-space-environment). This research had the purpose to formulate the interior design parameter with the ecological approach theoretically and study the application on the interior design object application on the environmental friendly buildings in Indonesia. Several design objects were chosen to represent various building characteristics, namely dwelling house, educational center, office complex, lodging, art gallery, café, and library.

Research Method and Objects:

Methods:

Following are five research stages would be executed, to achieve research result of contextual eco-interior theory and application in Indonesia:

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1. Theoretical Problem (description and interpretation), initiated from general description and implication about the sustainable development to the sustainable interior.
2. Idea Diagnosis and Argumentation (theoretical construction), is done by explain the idea diagnosis and argumentation, concept, and interrelatedness of theoretical and practical scope to formulate the eco- interior theory principles prevailing globally.
3. Practical Views Exploration (concept and application exploration), initiated by exploring the implication of sustainable design concept of the interior-designers and architects in Indonesia.
4. Objects Exploration and Evaluation (object evaluation), comparing the formulation result of Indonesian contextual eco-interior theory with selected object data. This stage is conducted as simulation of the resulted in eco-interior principles effectiveness.
5. Conclusion (conclusion and suggestion), structuring the research result analysis conclusion, namely the theoretical formulation of contextual eco-interior in Indonesia and its validation result to the selected design objects.

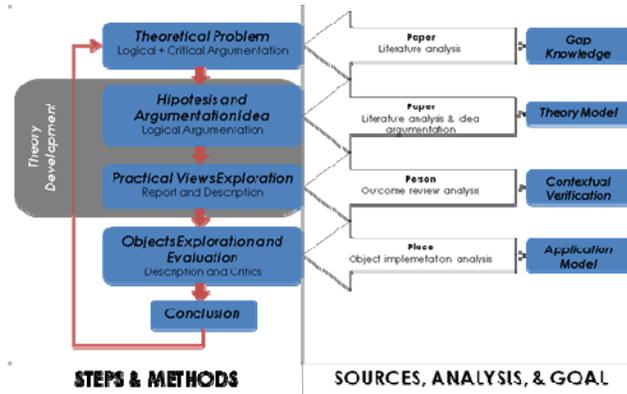


Fig. 2: Stages scheme and method of contextual eco-interior research

Research Objects:

Heinz Frick House, Semarang (HFH):

The house of Dr. Heinz Frick is located in the sloping crowded housing area, facing east and south with total average area of 200 sqm. Frick takes advantage of the slope to divide the building into two stories. Room layout is based on ecological house concept, with the applications such as: sedimented rainwater and distributed for bathing, washing, and watering. Further, for the waste water management, a vietnamese septictank is used to terminate E-coli and germs, and the waste water is able to be processed further as soil fertilizer. Frick also planted copper wire under the concrete stripe foundation for the electrical installation. Every socket outlets were connected with three wires and any iron building materials, columns, and concrete reinforcements were coiled to reduce magnetic field. Frick also created his own paint made of tapiocca flour mixed with 5% pine oil to avoid pests and fungi. Lithopon was also used as white pigment paint and the result was remarkably good for tropical humid climate in Semarang. Frick chose to use concrete block masonry wall which needed only 5 liter water on each square meter instead of brick masonry wall which absorbed 65 liter water on each square meter. Sun-facing wall were double-layered by 20-cms thickness natural stones so that the absorbed heat would penetrate into the rooms after 8.5 hours. The advantage is that the rooms will stay cool during the day and during the evening the heat will warm the house.



Fig. 1: Documentation of Heinz Frick House

Seloliman Environmental Education Centre, Mojokerto (SEEC):

This 3.7 ha area was designed as a medium for environmental education. Not only Javanese traditional concept building, it is also equipped with ecological-approached-management dry fields and garden, reforestation area, farms, soil fertilizer (kompos) plantation, water management and maintenance system, and garbage recycling area. The building was constructed with good-example spirit. The shape, facade, material,

landscape zoning, all take their own parts in environment conservation education. Water and its waste, furtherly processed to be able to divert back to its source, is thrown, and later distributed for the other function. Fresh mountain air is not manipulated, freely roaming, penetrating into the whole corner of the building. Insects are blocked by adding fish ponds circling the building units which also function as panorama and natural lighting reflector.



Fig. 2: Documentation of Seloliman Environmental Education Centre

Graha Wonokoyo Offices, Surabaya (GWO):

Graha Wonokoyo was the winner of Energy Conservation Competition in Office Building category by Mechanical Engineering Department of Indonesia Building Engineers Organization on July 2006. This led him to compete as well in ASEAN Energy Awards 2006 in New and Existing Building category where Grha Wonokoyo sat as second runner up after Malaysia and Singapore. Graha Wonokoyo is located in Raya Darmo protocol street, Taman Bungkul Surabaya, which is in the area of colonial housing building conservation area, well-known as Darmo site. The building mass is stacked step by step, starting from the opening building of two-stories mezzanine with the same height as its neighborhood, elongated from east to west. Then four-stories transition building as gallery hall and collective meeting rooms in the middle, ended with a ten-stories tower elongated from north to south matching to the site as the climax. This energy-saving building used bored-pile foundation, reinforced concrete construction, and iron roof frames. Optimized natural lighting is formed by maximized penetration of sunrays to the working area from south and east. Air conditioning system uses central AC – VRV system which is independently designed on each floor according to office operational-hours flexibility.



Fig. 3: Documentation of Graha Wonokoyo Offices

Kaliandra Sejati Nature and Culture Education Centre, Pasuruan (KS):

Kaliandra Sejati located on the foothill slope of Arjuna Mountain, Pasuruan Regency, East Java. Kaliandra Sejati has wide about 16 hectares and designed as the natural and cultural instructional media, particularly Javanese (and Indonesian Archipelago). Kaliandra Sejati consisted of building complexes, one of which is Hastinapura be of 5 masses of 2 stories building and used for staying overnight during the activities. The concern to environment that revealed on the open building design, in the entire of the existing building unit used the natural ventilation. The cooking activities still use firewood, and foods served come from the crops of own plantation. Bathroom also gets openness touch. Building materials choices also applied as the effort that makes it as an environmental conservation. Despite woods domination, but the kinds chosen on their availability in the nature. Bricks materials exposed and arranged in such a way reminding the Majapahit relic temple architecture. The composition of brick by brick as if return the Javanese architecture power. Form, material, landscape, and zoning play its own role in the context of nature and culture conservation education (Hendry, 2008).



Fig. 4: Documentation of Kaliandra Sejati (Hastinapura)

Selasar Sunaryo Art Space, Bandung (SSAS):

Selasar Sunaryo Art Space located on the Bukit Pakar Timur 100 Dago Atas, Bandung. SSAS stands on an area as wide as less and more 5000 m², where the width used for the construction of art gallery is about 1000 m². SSAS is a design of Baskoro Tedjo who cooperated with Sunaryo, the owner of SSAS to shape the art gallery based on the criteria proposed by Sunaryo, among other: Do not change site by do not demolish the existing area more than as necessary; Reflect the nature and character of Sunda culture; Reflect Sunaryo's characteristic, in other side the functional as art gallery (Ciwendro, 2010).



Fig. 5: Documentation of Selasar Sunaryo Art Space

Rumah Turi Hotel, Surakarta (RTH):

Rumah Turi is a boutique hotel located in the middle of Turisari residents' settlement, Surakarta and occupies area of 1000 m². Rumah Turi built by the principle utilizing what is around it thus the result is an environmental friendly hotel. One example very clearly seemed is the building material choices. Almost all of materials used are used or residual materials, such as paint that use the broken roof-tile that finely pounded then mixed with water and waterproofing and applied on the walls as paint. Temperature regulation conducted by creating the artificial rain in every morning so that the atmosphere became cooler. Waste water processed using infiltration well so that it can be utilized again become flush toilet water, plant watering, and artificial rain. Mosquitoes repellent utilize the natural material such as lemongrass (citronella) to reduce pollution in the room (Soegijanto, 2011).



Fig. 6: Documentation of Rumah Turi Hotel

RESULTS AND DISCUSSION

General Theory of Eco-Interior:

Identification is conducted start from the literature source original citation, sorting the discussion part related to the ecology and design, and classifying the study aspect in eco-interior context. Literature collection, sorting of discussions related to ecological and design, and study aspect rationalization in the interior context result in identification of 8 study aspects of interior scope, as follows (Yusita, 2007):

- Space organization, is oriented to activities and space requirements analyses, space grouping, determining side of a room, circulation and accessibility, and direction of the architecture-interior planned object to solar and wind direction path.
- Material choices, is oriented to materials which are ecologically suitable for exploitation and production terms and conditions with minimum energy usage and entropy conditions, no un-recyclable-to-nature transition, and more local nature resource is used.
- Lighting system, is oriented to the energy conservation effort emphasized in choice of lighting types and grades, natural lighting reflection technology, heat and glare reduction technology and using renewable energy resources.
- Ventilation system, is oriented to energy conservation effort by maximizing natural ventilation technology as well as passive solar energy usage with passive convective, radiative, and evaporative method.
- Water sanitation, is oriented to the application of the effort of circulation between water resource and its waste water management
- Interior (indoor) pollution, is oriented to the application of the effort to minimize the effects and anticipate of the growth of biological, chemical, and physical pollutants inside a space.
- Electromagnetic emission, is oriented to the application effort to anticipate technical radiation such as artificial electric field, artificial magnetic field, and artificial static magnetic field.

- Indoor waste management, is oriented to the effort application of consumption economizing and sorting for the goal with the principles to reduces, reuse, refunction, and recycle.

Contextual Theory of Eco-Interior

The theory and application of ecological design is always contextual, both in the context of setting the time and place according to their respective ecological condition. In a case study of applied eco-interior contextual in Indonesia, theory and simple parameters were built to identify applications which have been done in some existing buildings which are environmentally friendly.

Application that exists in the case-study objects in Indonesia is classified in four category :

- General application, that is generally applied without specific reasons in the context of responding environmental issues except ordinary used.
- Micro effort, that is the application which is done under circumstances as a response to the environmental issues, yet still un-focused and un-significantly influences others.
- Substantial effort, that is the application which is done under circumstances as a response to the environmental issues, yet un-focused and un-significantly influences others.
- Ideal situation, that is the application which is done under circumstances as a response to the environmental issues, and becomes the priority in design process.

Those application become a hierarchy which is analyzed in parametric table as a mean to study eco-interior application in the observed object. Eco-interior application hierarchy table was adopted and developed from DCBA Sustainable Housing in Indonesia method (Larasati, 2007), with adaptation of eco-interior context. The hierarchy related to the classification of application are: D for general application; C for micro effort; B for substantial effort; and A for ideal situation.

Contextual Application of Eco-Interior in Indonesia:

The physical design application on the 6 building and space objects considering the ecological aspect have been observed by the 8 eco-interior aspects approach. The existing applications are classified in categories of D, C, B, and A. The result, briefly presented in the following table 1:

Table 1: Global Classification of Eco-Interior Application on Case Studies Objects

Eco-Interior Aspects	Objects																			
Room Organization	HFH																			
	SEEC																			
	GWO																			
Material Choices	HFH																			
	SEEC																			
	GWO																			
Lighting System	HFH																			
	SEEC																			
	GWO																			
Ventilation System	HFH																			
	SEEC																			
	GWO																			
Water Sanitation	HFH																			
	SEEC																			
	GWO																			
Indoor Pollution	HFH																			
	SEEC																			
	GWO																			
Electromagnetic Emission	HFH																			
	SEEC																			
	GWO																			
Indoor Waste Management	HFH																			
	SEEC																			
	GWO																			
Room Organization	KS																			
	SSAS																			
	RTH																			
Material Choices	KS																			
	SSAS																			
	RTH																			
Lighting System	KS																			
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	RTH																			
Ventilation System	KS																			
	SSAS																			
	RTH																			
Water Sanitation	KS																			
	SSAS																			
	RTH																			
Indoor Pollution	KS																			
	SSAS																			
	RTH																			
Electromagnetic Emission	KS																			
	SSAS																			
	RTH																			
Indoor Waste Management	KS																			
	SSAS																			
	RTH																			

Discussion:

The observation result on the objects of study indicated several points related to application of eco-interior aspect involving room organization, material choices, lighting system, ventilation system, water sanitation, indoor pollution, electromagnetic emission, indoor waste management. The most maximal application was on the room organization aspect, with ideal (A) classification. This ideal application reached due to all objects have been designed with considering the direction and the space building opening to sun revolve direction, wind, view, and circulation optimally. The most minimum application was on the material choices aspect, by dominated by the micro effort application (C) classification. Ideal classification was only on the Rumah Turi

Hotel (RTH) object due to the object indeed has the major orientation on the used materials uses for applications of building, rooms, and its rooms complement.

Applications on lighting system, ventilation system, and water sanitation aspects were varied between substantial effort (B) and ideal situation (A). Applications on the aspects were regarded quite good due to all of objects had orientation for conservation and efficiency, both energy and water. Applications on the indoor pollution and electromagnetic emission aspects were, on average, the substantial effort (B). Classification (B) on the SEEC, KS, and SSAS objects, in fact, rather due to the air condition of their environmental natures that have been clean because the objects settings were on the plateau, and also did not overly need the high electricity consumption demands due to the limited activities, thus conditionally they could fall into classification B, although the effort conducted not too significant or micro effort (C). The indoor waste management application was very good, dominated by ideal classification (A). This case due to all of objects have had awareness of trash sorting since in the room, only GWO and RTH that did not continue their activities to the waste utilizing.

Conclusion:

The applications of interior-architecture design on the dwelling house building, and public facilities such as office complex, educational facilities, and lodging facilities existing in Indonesia (particularly in Java) were the realization of the understanding and efforts of the designer in responding the environmental global issues. The different understanding of every designer to the sustainable development concept resulted in the different emphasizes in design. The different emphasizes resulted in the different design application as well. Frequently, the last result was the partial application and less optimum holistically. There was also physical real condition constituting the result due to logical consequence trace of other aspect application and the advantage due to natural condition without substantial effort of the design side. Therefore, then it is needed a holistically ecological design approach agreed with the aspects needed contextually.

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