Environment Responses by Professional Role on Current Building to Achieve Sustainability: Bandung as a case study

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Abstract. According to the TOD development plan, issues and topics focus on the professional role of the environment responses aspect of the current building. Thus, this provides to the existing building towards the green achievement as the consequences of green implementation. Providing a clear overview for the reader, that the environment responses is one of the measures forward to mitigate significant impacts of the building stock on the environment, society, and economy. Professional for respondents taken from Bandung, Indonesia, exploring for knowledge and awareness. However, this paper consists of a critical review of the existing body of knowledge of professionals related to the role of sustainable achievement. Both definitions and scope of TOD development and infrastructure of the current buildings around on sustainability and discussions approach to achieve how professionals recognize their role in those aspects. Besides, predominately focus of professional knowledge as the aspects which are affecting sustainable building achievement. Finally, the components as the result must be considered during the pre-construction works period, which will be followed up by professionals in Bandung depend on TOD location. The nine attentions as the findings of the result to be carried out by professionals showing their role to realize and control of physical infrastructure that surround the TOD area in Bandung for the future through developing a strategy on green or sustainability control.

1. Background

Bandung nowadays becomes increasingly crowded by the population and migrants. These all affecting on transportation needs, that makes Bandung transformed to be a metropolitan city (Metropolitan of Great Bandung). The change of the metropolitan city viewed from the aspects of the population, economic activity, and the area developed. This condition resulted of development rapidly present. In 2010, the increasingly popular urban areas within the Great Bandung Metropolitan area consisted of the city of Bandung, the city of Cimahi, parts of the Bandung regency, parts of West Bandung regency, and parts of Sumedang regency. This condition implicates to increase supply of transportation networks and role.

Shows in Table 1, due to anticipate of transportation networks and role the Great Bandung Metropolitan needs proposed of TOD (hub terminal) towards 2031.[1]

Table 1 shows that consists of fourteen TODs would be realized in Great Bandung on 2031. Of course, this will affect the existence of the surrounding environment, especially buildings. According to this paper, the focus on existing buildings around TOD that not affected by the demolition of development.
Table 1. Proposed of TOD (Hub Terminal) 2031 in Bandung

| Location                          | Location                          |
|-----------------------------------|-----------------------------------|
| 1 TOD PPK Gedebage                | 8 TOD Bus Station Ledeng          |
| 2 TOD Rail Station Kebon Kawung   | 9 TOD Martadinata                 |
| 3 TOD SPK Ujungberung             | 10 TOD KH2 Padalarang             |
| 4 TOD Arcamanik                   | 11 TOD KH1 Cimahi                |
| 5 TOD Bus Station Leuwipanjang    | 12 TOD KH2 Soreang                |
| 6 TOD SPK Kordon                  | 13 TOD KH3 Tanjungsari/ JAtinangor|
| 7 TOD Bus Station Cicaheum        | 14 OD KH3 Majalaya                |

2. Literature Review

Transit-Oriented Development as a mixed-use residential, business, or commercial area intended to maximize access to public transportation. This condition always consists of a center of an activity with public transit station, and surrounded by high-density employment-oriented business, higher-density residential uses, and mixed-use development with gradually lower-density development spreading outward from the center. TODs or transit zones are typically located within a radius of one-quarter to one-half mile from a transit station, as this is generally considered to be a reasonable walking distance for pedestrians (center).

There are five major characteristics of TOD. Firstly, it has sufficient density to encourage public transit usage. Second, residences, jobs, and retail destinations are located close to public transit facilities. Third, consists of mixed uses, with retail and employment sites located within walking distance of residential areas. Moreover, fourth, built on a grid transportation network, which not divided into the arterial-collector-local road classification system in suburban areas. Finally, contain urban design guidelines and design features that encourage a greater pedestrian orientation, which use the automobile less in favor of more communal forms of transportation [2].

Overall, TOD is possible to become a gathering place for some community facilities in the form of infrastructure and new buildings as well as current buildings. According to this paper, this study focuses on the role of the existence of all infrastructure around TOD as a result of the construction of a new hub terminal (TOD) in the city of Bandung by 2031.

Moreover, Ingy (2017) found that achieving of the environment goals addressed a limited scope to the quest of viable strategies. Then it believed that will emerge as the physical environments and circumstances changing on continually which engenders new ideas and involves new roles on the part of different stakeholders. Such as the role of architects, decision-makers, and engineers working in the field will thus acquire further significance in the field. Besides, efforts on strategize efficiently towards achieving sustainability will assist policymakers, building owners, developers, planners, and other stakeholders within implementing the energy-efficient design with sustainable design and planning in the early stage of construction [3].

Furthermore, Employment (2017) stated that preparing of the building consent application documents and design advising that both needed to fulfill the requirements, for building applicants, owners, or professionals (architects & engineers) on behalf of clients, building authorities and territorial [4]. According to Cappelletti (2015) that the energy efficiency of existing buildings (the physical envelope, and the operational), the energy efficiency of types of equipment, support of ductions emission, change of attitudes and behavior, then lastly, substitute of fossil fuels with renewable energy will increase the scenario of the building policy [5].

On the other hand, Zhou (2015) stated that the aim of the Building Law of the function of the building addressed for all or part of the building on more broad activities (crowd, sleeping, work, intermittent, and other activities) has been categorized according to the law in building sectors [6].

Table 2 shows the all literature review found to identify the components that affected the role of professional to their works.
Table 2. Identifying the components of professional role on sustainable building

| NO | IDENTIFICATION                                                                 | AUTHORS                                      |
|----|---------------------------------------------------------------------------------|----------------------------------------------|
| 1  | Construction [7]–[10]                                                             | C.T. Griffin, et. al. (2009)                 |
|    |                                                                                 | Tarja Häkkinen, et. al. (2011)               |
|    |                                                                                 | Jennifer Garman, et. al. (2011)              |
|    |                                                                                 | Hamid Afshari, et. al. (2013)                |
|    |                                                                                 | Milad Samari, et. al. (2013)                |
|    |                                                                                 | T.M. Leung, et. al. (2013)                  |
|    |                                                                                 | Yong Han Ahn, et. al. (2013)                |
|    |                                                                                 | Mohd Reza bin Esa, et. al. (2011)           |
|    |                                                                                 | Heather Benjamin (2016)                     |
| 2  | Materials [7]–[10]                                                               |                                             |
| 3  | Information [7], [8], [10], [11]                                                |                                             |
| 4  | Advocation [7], [8], [10], [11]                                                 |                                             |
| 5  | Knowledge & education [8], [10]–[13]                                            |                                             |
| 6  | Cost [8]–[11], [14]                                                             |                                             |
| 7  | Investment [9], [10], [14]                                                      |                                             |
| 8  | Process of building production [7]–[9], [11]                                    |                                             |
| 9  | Lack of architects', consultants, & clients awareness [13]                      |                                             |
| 10 | Lack of education & information [13]                                             |                                             |
| 11 | Lack of public awareness [9], [15]                                               |                                             |
| 12 | Lack of political awareness [15]                                                 |                                             |

According to Table 2, there are twelve components that identified which are affecting to professional works on sustainable building. Numerous studies attempted to explain the sustainable development of current building consider to energy consumption through responses of adaptation use.
3. Methodology

Objective: Identifying the professional role to respond the physical development.

Methodology: Mix-method approach.

Data collection instrument: Semi Structured Interviews.

Data collected: Knowledge and awareness of professional on current development.

Respondents: Fifteen limited Professionals, who are responsible in master builder & engineering.

Data signification: Understanding the problems, that obtained from both perspectives of professional knowledge & awareness.

Data analysis: Interviewing, Excel 2013 and SPSS v.25.

4. Results and Discussion

Table 3 shows the result of all interviewee characteristics to respond the interview who accomplish the objective.

| Registered Member | Professional Certified | Green Certified | Project Experience | Rating Tools | Working Years | Academic |
|--------------------|------------------------|----------------|--------------------|--------------|---------------|----------|
| Valid              | 15                     | 15             | 15                 | 15           | 15            | 15       |
| Declare            | 15                     | 15             | 15                 | 12           | 15            | 15       |

According to Table 3, illustrates the background of demographies that identified the characteristics interviewee. Registered member, professional certified, and green certified as the criteria that entirely assessed by the Indonesian accreditation board. Not only for sustainable project experiences within three to nine years, but also rating tools that considered to assess their works with Greenship or SEDCK 86-2016. Related to this registered member, professionals may promote his status to professional certified. Then, green-certified becomes the priority requirement for the acknowledgment of the validity of sustainable praxis. While in working years and green experiences needed to know with Greenship or SEDCK 86-2016 rating tools usage. On the other hand, the interviewee must graduated from architect and engineering school, and be recognized that they are on ten for under-graduate, four for post-graduate, and one for Ph.D. Hence, all interviewee requirement fulfill. Hence, all interviewees available on the requirements of the study.

Then, Table 4 shows the result of professionals respond based on the identified component.

| No. | Aspects | Comments & Respond | Implication | Attention |
|-----|---------|---------------------|-------------|-----------|
| 1   | Construction | - Green management becomes green contractors and sub-contractors requirement - For small and medium projects become a tendency maintain on practices currently | Needed of knowledge and green management for all types of the project for contractors and sub-contractors on green specialized | Green Construction |
| 2   | Advocation  | - Collaboration not to be occurred without advocated by building stakeholder - Large-scale projects noticed by green building experts - Small and medium scale buildings (less than USD 100,000) did not much regard for the green design team | Collaboration needed to occur when working with building stakeholder on sustainability | Building Stakeholder |
| 3   |          | - Professionals must possess the knowledge and educational availability | | |
Based on Table 4, the result illustrated that all from the interview have the column of category as (a) aspects, (b) clarification, (c) implication, and (d) attention. Moreover, each has findings of the clarification to obtain problem-solving on current condition as (1) green construction implicates for construction works, (2) building stakeholder for advocacy, (3) certified professional for best knowledge and education, (4) green product for the process of building production, (5) delivery on materials, (6) SOP manual for information, (7) an operation based on the cost estimate, (8) on the hidden cost of investment, (9) green product for public awareness, (10) the green design team for architects, consultants, and client awareness, (11) green policies for knowledge (education and information), and lastly, (12) green knowledge for political awareness.

Related to the result, all identified as driving factors that begun to move more aggressively to achieve the goals of sustainability in the built environment due to new infrastructure demand. Then, based on Table 4 also found that both aspects and attention should introduce and promote how green implicate to solve the problems of new development currently.

According to this study, Transit-Oriented Development aims to anticipate a mixed-use of residential, business, or commercial area intending to new development currently of maximize access to public transportation. This condition always consists of a center of an activity of society and surrounded by high-density employment-oriented business, higher-redensity residential uses, and mixed-use development with gradually lower-density development spreading outward from the center. So many

| Knowledge & Education | Needed professional on knowledge and educational availability on green work | Certified and Green Professional |
|-----------------------|--------------------------------------------------------------------------------|---------------------------------|
| Process of Building Products | Obtaining on green material in a short amount of time | Green Product |
| Materials | Unrecognized types of green materials by professional for building material assembly | Complicated the availability of green material in project time and project location |
| Information | Guidance to operate the green devices required | Needed a Standard Operation Procedure manual to operate green devices |
| Cost | Green construction, the green design team, and green material used will be increasing to the premium costs | Costs and green work have relating to both, that affect increasing premium costs |
| Investment | Same respond with Cost component | Administration and technology become a high-cost value for investment |
| Lack of public awareness | Needed to introduce the type of green material to client | Introducing and promoting green material to client |
| Lack of architects, consultants & client awareness | Needed to collaboration team-work, and advocate the client | Introducing and promoting the team of green design |
| Lack of education and information | Due to a lack of information and knowledge, often occurs rejection when documents submission on process | Occurring of the rejection process in submission |
| Lack of political awareness | Environmental policy issues in many construction projects neglectful | Recognizing of green policies |

| Process of Building Products | Product knowledge becomes recognition of green material | Green Product |
| Materials | Unavailable related to location the project and affected the availability of limited construction work time | Delivery |
| Information | Guidance to operate the green devices required | Needed a Standard Operation Procedure manual to operate green devices |
| Cost | Green construction, the green design team, and green material used will be increasing to the premium costs | Costs and green work have relating to both, that affect increasing premium costs |
| Investment | Same respond with Cost component | Administration and technology become a high-cost value for investment |
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| Lack of education and information | Due to a lack of information and knowledge, often occurs rejection when documents submission on process | Occurring of the rejection process in submission |
| Lack of political awareness | Environmental policy issues in many construction projects neglectful | Recognizing of green policies |
possibilities of new construction and current buildings which will has the physical development impacts. Then, as shown in Table 5, the components identified enable to rank based on Mean scores.

Table 5. Rank of the Components Based on Mean Descriptive Analysis

| Components                                | N  | Mean     | Rank |
|-------------------------------------------|----|----------|------|
| Construction                              | 15 | 4.1333   | 5    |
| Materials                                 | 15 | 4.0667   | 6    |
| Information                               | 15 | 4.2000   | 4    |
| Advocation                                | 15 | 4.6667   | 1    |
| Knowledge & Education                      | 15 | 4.6000   | 2    |
| Cost                                      | 15 | 4.1333   | 5    |
| Investment                                | 15 | 3.6667   | 9    |
| Process of building production            | 15 | 4.4000   | 3    |
| Lack of architects, consultants, & clients awareness | 15 | 3.8000   | 8    |
| Lack of education & information           | 15 | 4.2000   | 4    |
| Lack of public awareness                  | 15 | 4.0667   | 6    |
| Lack of political awareness               | 15 | 4.0000   | 7    |

Related to Table 5, illustrated that the rank has identified based on scoring by mean. All components needed by professional to the response awareness on physical development currently which surround on the TOD for new construction or current buildings.

Next, shown in Table 6, summarized that professional role found the priorities of the components for sustainable development with rank, from first to ninth rank.

Table 6. The Priority Respond of Professional Role for Sustainable Development

According to Table 6, illustrated that this will be a motivation on a pressing matter at hand to control of physical development requirements for TOD development in Bandung to the next. While this needs not only for new construction but also for existing or old construction surrounded TOD development. This chart shows that have four ranges in mean on 4.67 – 4.60, 4.40 – 4.20, 4.13 – 4.07, and 4.00 – 3.67, which describe the components positioned on the first rank until ninth rank.
The first range in mean 4.67 – 4.60 as (1) Advocation become initially supported by building stakeholder. It needed to guide building applicants, owners, or professionals (architects & engineers) on behalf of clients, building authorities, and territorial preparing consent on submission documents and advising on design and planning requirements. Both client and design team, have to work collaboratively to achieve sustainable goals for better than standard requirements. This awareness on Building Stakeholder; and (2) Knowledge and Education of building stakeholders need awareness of the risks and unintended consequences inherent in current practice for sustainable issues. This awareness on Certified and Green Professional.

Second range in mean 4.40 – 4.20 as (3) Process of Building Production is choosing the construction material that requires on green or sustainable selected. All affecting to the energy efficiency of current buildings (both physical and operational envelopes), the energy efficiency of equipment, and supporting emission reduction in the building sector. This awareness on Green Product; (4) Information intended that taking into account the aspect of renewable energy technology used in the buildings. This awareness on SOP Manual.; and the same rank on (4) Lack of Education and Information, intended that decreasing the chances of obtaining green building designs approved of acceptance, caused by less knowledge in green building practices. This awareness of Green Policies.

Third range in mean 4.13 – 4.07 as (5) Construction convinced that significant problems on the initially cost premium, long payback periods, keep on current practices, and limited knowledge and skills of subcontractors. This awareness on Green Construction; and the same rank on (5) Cost intended that technology implementation, current practices, limited knowledge, and understanding to take into account aspects of energy, water, materials, and costs for occupant welfare, environmental performance, and improved economic returns. This impact on high capital costs caused by using renewable energy technology used. This awareness on Operation; (6) Materials convinced that an appropriate strategy operation may achieve green certification even though with conventional technology used. Due to the purchasing and procurement of green material their uncertainty for future cost and availability stock. This awareness on Delivery; and the same rank on (6) Lack of Public Awareness intended that needed on marketing and publication development of public awareness towards a green and sustainable achievement for a current condition. This awareness of Green Product.

Lastly, the fourth range in mean 4.00 – 3.67 as (7) Lack of Political Awareness intended that develop on sustainability to create a paradigm exchange of environmental issues as policy pressure in the construction industry. This awareness on Green Knowledge; (8) Lack of Architects, Consultants, and Client Awareness convinced that promoting of client awareness for benefits and methods sustainable requirements, rating tools, competencies, and the team of sustainable or green works. This awareness of Green Design Team; and (9) Investment intended that was caused by high capital costs on renewable energy technology, which is helping to achieve green-certified due to operating strategy appropriated. This awareness on Hidden Cost.

Furthermore, all those responses contain the current projects which have something to become obstructed, hindered, impeded, or stopped the ability to progress. Besides, to make it slow down on the progress works. This could be conceived that physical infrastructure development obtains to control by a professional role in the current building to achieve sustainability.

5. Conclusion and Recommendation
Generally, the response was given to the current building because of the implication as to the problems of achieving the sustainability for current physical infrastructure that surrounding the TOD development, before the construction period carried out. Related to the goals, design, legality, significance, barriers & obstacles, these things do not to be yet considered by professionals present to do green works on current buildings. Furthermore, reducing energy consumption also received unequal responses from the result. Thus, the components as the result that must be considered during the pre-construction period for professionals work, which will be followed up by professionals in Bandung depend on TOD location.
Finally, there are nine ranks of attention to be watched out for guiding the sustainable works, as (1) Building Stakeholder, (2) Certified and Green Professional, (3) Green Product, (4) SOP Manual, and Green Policies, (5) Green Construction, and Operation, (6) Delivery, and Green Product, (7) Green Knowledge, (8) Green Design Team, then lastly, as (9) Hidden Cost. All these nine-attention carried out by professionals to show their role to realize and control of physical infrastructure construct surround the TOD area in Bandung for the future.

Context of Great Bandung Metropolitan, the security of water and energy, solar sources, sustainable development, and perceptions of cost life-cycle are expected to the growth of low carbon development in 2031, concomitant to Bandung TOD Planning 2031.

Hence, the contribution to knowledge is on sustainability initiatives reducing building operation and environmental impacts and enable to increase the in-building adaptability, durability, and resiliency studies for current buildings and environment. Lastly, this would be a recommendation for further use by professionals and local government according to the project types that continue to guide forward the building life-cycle completely to achieve sustainability.

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