

# Identification of Increasing *Green Behaviour* in Citraland Bagya City, Medan

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**Abstract.** This present time, Indonesia just began applying the concept of Green Architecture. The actions require community participation as residents and the users of the building. The built environment is designed around the idea of Green Architecture but inhabited and managed improperly; the goal of sustainable built environment is not achieved. The aspect of behaviour is the key factor in the implementation of Green Architecture's concept. This research is a descriptive exploratory which is to identify the problems to the implementation of Green Architecture's concept in planned housing. Then the study will explore the components causes of the problems used as a problem solver. The study conducted on the living behaviour in Citraland Bagya City's resident. The estate is designed and built with the concept of Green Architecture in Medan city. The research was carried out by the four aspects of housing are the physical, social and cultural, policy, and management issue. These three components will indirectly relate to the economic issues that are the efficiency and effectiveness of living behaviour. The results showed that the increasing of green behavior is still small and the occupant requires motivation and socialization of living green.

## 1. Introduction

Global warming and climate change have become a reality, and not just a natural phenomenon and the mistakes of human activities result in managing nature and the environment. The Earth's temperature rises due to the greenhouse effect that prevents the reflection of the sun's heat out from fossil fuel combustion emissions (oil, gas, and coal), energy (industry, transport, electricity), land use change and general development. The environmental degradation conditions are increasingly drastic at the end of this century, beginning with the industrial revolution in the early 1900s. Transformation of human life from the traditional agrarian society into a modern industry.

Society awareness regarding the sustainability of environment is critical issue today where pollution and environmental degradation is unavoidable [1]. The root of problem environmental damage is the fault of human behaviour to the views of himself, nature and the relationship between man and nature [2].

Green Architecture's concept is planned as a strategy to solve environmental's problems. Criteria for 'green' building in Indonesia should be based on the suitability of the building with the tropical climate and high humidity. The application of the Green Architecture's concept in Indonesia has also been



supported by regulation: Act No. 26 in 2007 about Spatial Planning, Act No. 28 in 2002 from Ministry of Building and Public Works about Green Open Space. Ministry of Health related to health care in the building and the quality of water, SNI (Indonesian National Standard) in the formation of Green Building [3]. At this present time, Indonesia began applying the concept of Green Architecture by establishing an independent Green Building Council Indonesia (GBCI) in 2009. The institution conducts an assessment of the new buildings and old buildings in Indonesia. Learning from countries that have implemented the concept of Green Architecture, these systems have become part of the market and the trend of building motivated by the higher consciousness of the citizens to be more concerned about the environment. Governmental and environmentalist groups encourage individuals to *go green* and many assert that there are different levels of *being green*. Occupants become greener by changing their behaviors, often motivated by a concern for the environment, a desire to reduce exposure to contaminants or a desire to save money. [4]

Moral movement requires community participation as residents and users of the green building. Although a building is designed by Green Architecture's concept when inhabited and managed incorrectly, the condition of environmental improvements will not be achieved. Then the aspect of living behavior is the key factor of success applying the Green Architecture. In other words, Green behavior still need to be established, especially in urban communities [5]. Research on the importance of sustainability and low carbon living done in new housing mostly, because the consumption of energy and resources is not just what goes into the building, but also long-term through occupancy and activities [6]. Based on these developments, it is necessary to do the research for the success of Green movement implementation, especially in urban communities in Indonesia.

The research purposes are: (1). To identify of green behavior phenomena on a planned housing. (2). To develop strategies for behavior development in sustainability of Green Architecture's concept.

## 2. Literature Review

### 2.1. Green Architecture

The declaration of sustainable development by the United Nations Commission on Environment and Development in 1987 is closely related to the interests of the architect as the designer of built environment. Green architecture is a consequence of the concept of Sustainable Architecture. By designing the Green Architecture will appear the expectation of people could live and conduct activities on this earth in a sustainability.[4]

Green architecture is a design of the built environment, settlement, and a complete building. The design must have the financial criteria in using natural resources, at least have minimal in negative impact, as well as to improve the quality of life. [7]. The implementation of Green Architecture to the built environment based on the scale of the city, part of the city and the building. Based on the level of application of the concept, the components of the application of Green Architecture in the built environment is as follows (Table 1):

**Table 1.** Implementation of Green Architecture

| City                            | District                      | Building                |
|---------------------------------|-------------------------------|-------------------------|
| Utilization of Renewable Energy | Location and site             | Efficient Energy Design |
| Efficient Energy City           | Improving the quality of site | Building material       |
|                                 | Pedestrian path               | Water conservation      |
|                                 | System transportation         | Building comfort        |
|                                 | Minimizing heat transfer      |                         |

### *2.2. Implementation of Green Architecture in Indonesia*

The Green Architecture campaigns in Indonesia have already started encourage with the slogan 'go green'. Many buildings such as residential or commercial building began to harmonize with the concept of Green Architecture. Green Architecture knowledge has different perception in communities. Some suggest that the volume of the building (coefficient building site / KDB) must be less than the coefficient of a green area from the total land area. Balance of coefficient building site/KDB (50% -70%) compare with the ratio of green space / KDH (30% -50%) is expected to realize livable housing and healthy consistently [8]

Legal aspects of the building construction regulations exist at the level of legislation and regulation of derivatives such as spatial planning, buildings, as well as the Indonesian national standard development. In a planning document rules, which become mandatory while this rule on the suitability of land use, building intensity (KDB, KLB) and the building demarcation. For the building scale, only the standards directly related to the safety and security of the building.

The establishment of the Green Building Council Indonesia (GBCI) is a non-governmental organization in 2009 which assesses new buildings based on the concept of Green building. The Green Building Assessment on old buildings can be assessed the ranked and has certified GREENSHIP. The ratings are divided into six aspects: (1). Appropriate land (2). Re-Energy efficiency and refrigerant (3). Water conservation (4). Sources and Material cycle (5). Air Quality and Comfort (6). Management Built Environment.

The implementation of Green Architecture in Indonesia is at the socialization and began implementation stage on a small portion of buildings in Indonesia. While the primary target of the implementation of Green Architecture is expected to be a right movement that will influence the community. To achieve sustainable development is still a long journey, the research objectives which improving the implementation of sustainability is urgently needed.

### *2.3. The phases of increasing Green Behavior*

The changes in increasing green behavior divided into five stages [9]. The first stage is knowledge. The Society must become aware of the potential actions, behavior, technology or idea. They have to know all the problems why it is important to maintain environmental sustainability. This knowledge must present along with information how to solving the problems can be very beneficial to the settlement. There are four motivation that made households belief about green homes such as financial incentives, healthy and sustainable environment, energy efficiency and livability. [10] The second stage is persuasive. After the people have the knowledge about environmental sustainability, then the next step is to form positive and negative attitudes about environmental sustainability. Environmental sustainability should be stated relating to the issues that are crucial in human life. The sustainability will affect the public to realize that it would be good to increase green behavior. It's important to inform how the implementation of green actions, and how the experience of which applied green behavior. The third stage is the decision. After the public has believed that behavioral changes can give a real impact, then they will decide to apply green behavior in everyday life. In some cases, by asserting the possibility for a change may encourage people to try a new concept of green behavior. The fourth stage is the implementation. At this phase, people involved in the new behavior. The process is not just something that they think, but it is a real activity. At this stage, the support is necessary so that the information about procedures is essential to prevent frustration and moved backward. Occupants may make modifications in applying green behavior to suit the needs of residents. To spread the changes to other community, will need to be shown that the changes in the implementation of the Green behavior are possible. The fifth stage is the confirmation. At some occupants, the implementation stage is the final stage of the behavior change process, but on the other may require this fifth stage. At this stage they need additional information to determine whether to modify the behavior is correct. Additional information will help define the behavior change is a right decision.

#### 2.4. Green Behavior

The increasing of CO<sub>2</sub> gas because of human activity that tends to depend on the use of fossil energy. Some activities in a residential environment that contributed to the release of CO<sub>2</sub> gas is cooking, the use of stove oil, gas and electrical appliances fossil energy consumptive.[11] Children game activities that used to need human power such as running, playing in the open air has been replaced by the game that relies on electricity such as computer games and electronic games. Life in the big cities where used to transportation using animals or walk now been replaced by motorized transportation. This condition is also made worse by the transportation system inadequate and causing traffic jams everywhere.

The tendency of occupants to use a private vehicle instead of public transportation also increase the amount of CO<sub>2</sub>. The design of Green Architecture needs to support by the residents for the achievement of the green condition. The concept of simple life, saving, not consumption, disciplined, orderly comply with the rules of living together, natural environment, and others toward green architecture.

### 3. Method

The research is a descriptive exploratory type. A researcher is trying to identify the problems in the implementation of Green Architecture in planned settlement. Then this study will explore the stages of increasing green behavior in the residential environment. The research is conducting in Citraland Bagyacity housing estate as a case study. Because this property was designed and develop by the concept of Green Architecture.



**Figure 1.** Citraland Bagyacity Housing Estate

The research was carried out by developing four residential aspects is Physical, Social, and Cultural, Regulatory and Management. These three elements will indirectly relate to the economic issues, namely efficiency and effectiveness in living. The method of data analysis is a method of spatial frequency distribution and explorative descriptive. Analyzing of spatial and management variable is using spatial analysis. Observing the activity and occupants behavior in public space and identified the spatial area

which attaches with occupant activity. Analyzing of regulation variable and socio cultural aspects is using the frequency distribution. Occupants mobilization become observation variable with the parameter is the choice of transportation modes. Occupants activity behavior in the open space become observation variable with the parameter is the frequency of open space used. Identification of green behavior based on the phases of increasing green action parameters.

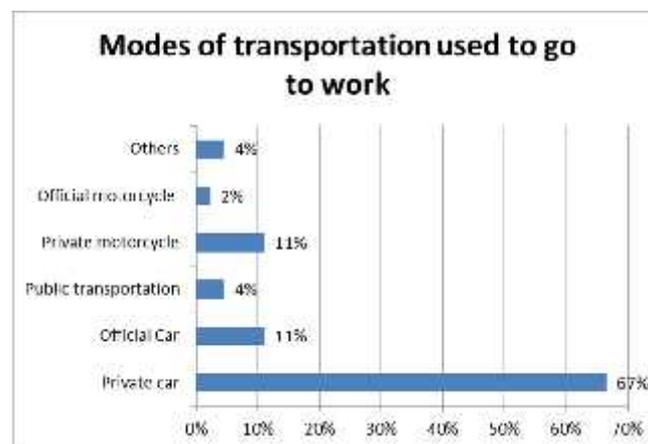
#### 4. Results and Discussions

Based on the analysis of the open space total area, CitraLand Bagya City housing efficiency is only 46%. Basic Building Coefficient (KDB) 46%, and 54% area of CitraLand Bagya City designated as open space, parks, road, and lake. Based on planning regulations in Government of Deli Serdang Department of Human Settlements, Basic Building Coefficient (KDB) for housing is 60%. The developer proves that in the beginning, the estate implementing the concept of ecological residential by designing greater percentage of open space than building.

The backyard divided into two elements, namely solid items such as pavement carport and open space elements such as a park. The park at the front of the house has an area of 26.81 ha or 12.67% of the total area. The regulations of CitraLand Bagya City management did not allow residents to close the front yard and side yard of the corner house with the pavement, but homeowners often add building and pavement on the back yard. The backyard cannot be controlled entirely by the developer. Housing managers can advise homeowners not to cover the entire back yard with a building for ventilations and lighting.

##### 4.1. Analyzing occupants behaviour

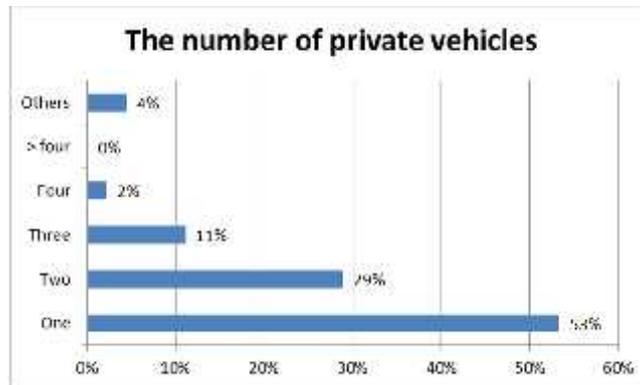
Collecting data is using survey method by distributing questionnaires to residents of Citraland Bagya City estate and 45 respondents are willing to be a sample. There are four groups of questions associated with the behavior of the occupants. (1) Questions related to the behavior of the occupants mobilization. (2). Questions related to occupant behavior towards the public space (3) questions related to behavior of water management and (4) questions related to behavior of waste management.



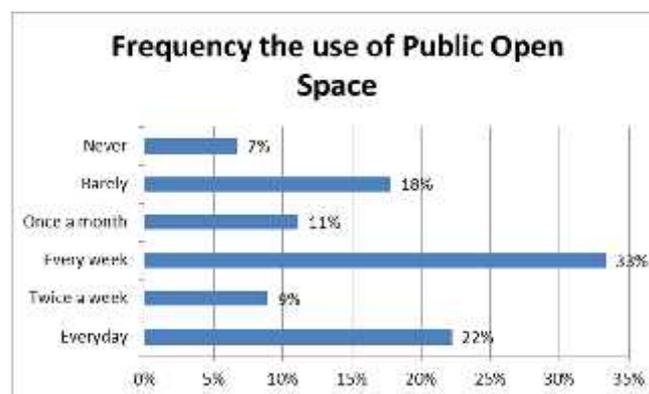
**Figure 2.** Modes of Transportation

In Figure 2 seems like that 67% of occupant using private transportation to go to work. Only 4% of the occupants used public transportation. Mobilization of occupant behavior indicates green behavior has not been achieved. Even in the Figure 3 shows that 29% of the occupants had two private vehicles and 11% of the occupants have 3 personal vehicles. These results indicate that the use of private vehicles for the occupant's mobilization are still high. This condition also occurs in cities in Asia. Due to the increased use of private car then the economy has also increased. [12] who do research in China found that urban residents were more accustomed to green commuting than were suburban residents, and had

greater willingness to maintain it. Reduced frequency of private car used by urban residents will transform into green commuting.

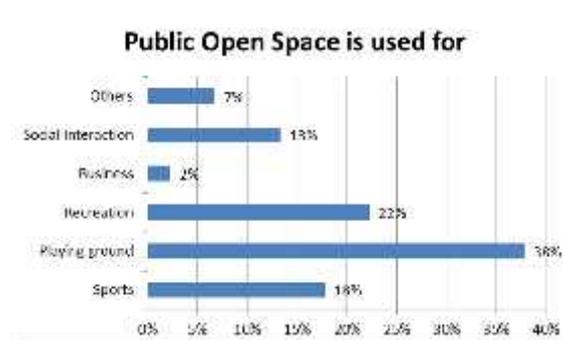


**Figure 3.** The ownership of private vehicle



**Figure 4.** The use of Public Open Space

The use of open space around the dwelling quite often seen in Picture 4. There are 33% of the occupants take the benefit of the open space regularly every week. Activity is carried out as a playground. Only 22% of residents who utilize the open space every day and this is usually using the open space by the housewives and children in the morning or afternoon. In Picture 5 seems like there are 18% of the people who take advantage of the open space as a place to exercise.



**Figure 5.** The Benefit of Open Space

According to Perry in [13], an ideal residential neighborhood is able to provide public facilities such as open space, local shops, internal street, and institution sites. The livable activity in the open space indicate the facility is suitable to be placed in the housing. The facilities such as open space and local shop in the estate support the occupant's activities every day. In addition to increase social interaction among residents, the facility made the atmosphere inside the housing environment becomes more alive. At the local shops, the occupants could buy their daily needs without leaving their residential environment. Open space can support community activities such as recreation, play, and interact with other people.

After conducted field observations at the estate, it seems that the achievement of green behavior is still not succeeded. Although the planning and housing management already implemented Green Architecture's concept. From the analysis results in Table 2 shows that the implementation of green architecture in the design of site planning and implementation of regulations related to open green spaces has reached the stage four. Some of the strategies that can be implemented are to facilitate public transport is achieved by the occupants so that the use of private vehicles can be reduced. But this requires the cooperation between developers, housing managers, and residents

**Table 2.** Analizing of Increasing Green Behavior

| ACTIVITY                  | Knowledge | Persuasion | Decision | Implementation | Confirmation | ANALYSIS   |
|---------------------------|-----------|------------|----------|----------------|--------------|--|
| Mobilization              |           |            |          |                |              | Need socialisation of green behaviour  |
| Building renovation       |           |            |          |                |              | Need to setting regulations related housing ordinance to build environmentally friendly      |
| Open space utilization    |           |            |          |                |              | Need engagement of housing managers to improve environmental quality                         |
| Site planning             |           |            |          |                |              | Monitoring and evaluation should be carried out for the management of backyard and frontyard |
| Transportation system     |           |            |          |                |              | Need socialisation of green behaviour  |
| Regulation implementation |           |            |          |                |              | Need to implemented monitoring and evaluation the application of regulation                  |

## 5. Conclusions

The planning of master plan and open space had implemented the criteria of green architecture. Estate manager is also maintaining the availability of water catchment areas in order not to cause flooding in the surrounding. Although the planning of transportation system still oriented to the use of private vehicles because consumers demand. The behavior of occupant's mobilization relies on the use of personal cars so that adding the release of CO<sub>2</sub> gas. The use of open space is not maximum only for a play and recreation area.

The occupants still need socialization related to green behavior. This situation led the housing manager to monitor and evaluate the changes of residential area continuously. Socialization activities of

green architecture are very necessary to provide education to the occupants about how to implemented green behavior. The existence of a right infrastructure and arranged in each building can make the resident's comfortable stay and activities in a residential area. Although there is the facility in a housing estate, if these services are not managed properly, the occupants will continue to use the existing facilities outside of the housing estate. Activities occupant's mobilization out of the residential neighborhood would cause CO2 emissions get worse because they usually use the private vehicle. Increasing the use of public transportation is highly recommended. It is better to design a system of public transportation in the area so that can easily reach by residents.

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