Risk Analysis of Inhibitors of Sustainable Construction Application in Building Construction Project in Jakarta

Manlian Ronald. A. Simanjuntak¹, Betalia²

¹) Professor in Construction Management at Graduate Program of Civil Engineering, Universitas Pelita Harapan, Indonesia
²) Graduate Program of Civil Engineering, Universitas Pelita Harapan, Indonesia

Abstract: The existence of construction projects has two unseparated faces. In one hand, the construction sector can improve human quality of life by providing infrastructures and buildings that support community socio-economic developments. On the other hand, however, this sector also contributes to the environmental damages. Sustainable construction refers to the usage of different construction method (than the conventional one), whereby that method has lesser environmental impacts. Sustainable construction tries to achieve a balance between, socio, economic and environmental aspects of a construction process so that optimum cost and advantages can be achieved by evaluating them to those three aspects. In reality, application of sustainable construction of building construction project in Jakarta faces some barriers. To improve application of sustainable construction in construction sector, a proper understanding of sustainable construction in building in Jakarta is needed. Identification and analysis of risk factors that inhibit application of sustainable construction in building construction project in Jakarta are also important to be done. This research is using quantitative approach by involving the owner as research subjects. Factors and variables of the research are set based on theory and relevant studies to become the basis of questioner establishment. This research identifies four (4) variables that contribute as the inhibitors to the sustainable construction application in building construction projects in Jakarta, i.e.: hesitations of all involved stakeholders in the project to try new ideas due to its risk factors, lack understanding of a good sustainable construction, separation of budget and operational cost, as well as lack of leadership. The research recommends the provision of data of risks assessment application of sustainable construction and project samples, formulation of a proper description of sustainable construction, formulation of overall project life cycle costs, improvement of leadership in sustainable construction application.

Keywords: risk, inhibitor, sustainable construction, construction project, building, owner

1. BACKGROUND STUDY

Construction sector has a big contribution to the Indonesian economic development. In 2016, construction sector were the highest four contribution to the Indonesia Gross Domestic Product (GDP) [52]. Construction sector also placed the third after food processing and trading as an economic growth booster in Indonesia during 2016 with contribution of 0.51 percent [51]. In 2017, construction sector is one of Government priority sectors targeted to grow to 8.1 percent [43].

Sustainability concept was introduced by World Commission on Environment and Development in 1987. Sustainability in broader sense defined as “the ability to meeting the needs of the present without compromising the ability of future generations to meet their own” (United Nations World Commission on Environment and Development, 1995: 51, 71). Based on Kuhlman and Farrington (2010), sustainability can be defined as maintaining well-being over a long, even an indefinite period. In this sense, sustainability tries to meet the needs of the present without compromising next generation quality of life.

According to Atombo, Dzantor and Agbo (2015), the current challenge faced by the construction sector was not only to complete the project on time, within budget and on the agreed quality, but also to meet balance arising from the developments which are impact to the economic, environment and community needs. Therefore, implementation of construction sustainability is important.

Construction sustainability is one form of sustainable development in construction sector. Sustainable construction refers to the usage of different construction methods (from the conventional construction methods), whereby those methods gives lower impact to the environmental damages [36]. Sourani and Sohail (2011) stated that sustainable construction is about achieving the balance between socio, economic and
environmental aspects of construction, so that costs and advantages can be evaluated to those three dimensions and optimized. While Khaflan and Ochieng (2014), stated that sustainable construction which balanced socio, economic and environmental targets was the agenda of global construction industry.

According to Berg (2010), risk management was an activity that integrates risk identification, risk assessment, strategy development to control risk, and risk mitigation by using managerial resources. Integrated risk management needs sustainable measurement of potential risks for the overall level of the organization and then collects the result to the corporate level to facilitate priorities and better decision making process [10]. Hence, risk identification is an important initial stage in establishing next step to anticipate the risks.

In reality, implementation of sustainable construction in building construction project in Jakarta is facing some barriers. This can be seen by how little the building construction projects that applying sustainable construction concept in the design and implementation. To improve the implementation of the sustainable construction, it needs a good understanding of sustainable construction in building construction in Jakarta and it needs identification and analysis of risk factors that inhibit the implementation of the sustainable construction in building construction projects in Jakarta. With a clear understanding, it ease the stakeholders in construction industry to apply the sustainable construction. Thus by identification of the risk inhibitors, solutions and recommendations can be proposed to anticipate the risks and rectify the action to make sure that the development in Jakarta follow the sustainable construction.

The study will discuss the following:

1. What is the sustainable construction of building in Jakarta?
2. What are the factors and risk variables that inhibit the sustainable construction application in building construction in Jakarta?
3. What are the recommended remedies based on the model analysis results.

2. ACADEMIC REFERENCE

2.1 Risk Management

In AS/NZS 31000:2009 risk defined as “the effect of uncertainty on objectives”. While risk management defined as a coordinated activity to direct and control an organization related to risk. Based on A guide to the Project Management Body of Knowledge (PMBOK) 5th edition 2013, project risk management includes a process in risk management design, identification, analysis, design response and risk control in a project. Based on Berg (2010), risk management is an activity that integrates risk identification, risk assessment, strategy development to control risk and risk mitigation by using managerial resource. Similar definition stated by Dieguez (2014) that risk management can be defined as a systematic process to identify, analyze and anticipate project risks.

According to Institute of Risk Management (IRM) in A Risk Management Standard (2002), Risk management is the core part of any strategic organizational management. Risk management is a process where an organization regularly anticipates risks relate to their activities to achieve sustainable benefits in all activities. In AS/NZS 31000:2009, stated that the successful of risk management depends on the effectiveness of management framework that gives basis and regulation that will be incorporated in all organizational level.

According to PMBOK, the purpose of risk management is to improve possibilities and positive impacts, and to reduce possibilities and negative impacts in a project. Every activity in a project must have impacts both positive and negative. Risk management in this case, tries to maximize positive impacts and minimize negative impacts resulted from an activity.

Based on Tilk (2011) project risk management improves the possibility of project success. Risk management provides overall picture of risks, challenges and potential problems and process derived to assist in monitoring and management. Project risk management will provide clear picture of project risks and its strength and help to understand and measure accuracy and relevancy of project scope of work, validate and communicate project progress and its risks, evaluate and measure project progress to the benchmark and ensure project accountability and stakeholder management.

2.2 Sustainable Development

Sustainable Development, based on United Nation in the Report of the World Commission in Environmental and Development: Our Common Future (1987), is a development that meet the needs of the present without compromising the ability of future generations to meet their own. Further on, the report explained that one prerequisite of
sustainable development is to create production system that consider basic ecological demand.

Sodagar and Fieldson (2008) stated that sustainable development is not merely energy efficiency, to achieve sustainable development must seek a balance between socio, economic and environmental aspects. This mean not only changes in designing, constructing and demolishing a building, but also needs changes in human lifestyle to reduce ecological impacts to the level accepted by the nature.

There are three important aspects of sustainable development known as three pillars of sustainable development. Those are Economy, social and environment. World Summit 2005 Document stated that those three pillars are inter-correlated and are stimulants to sustainable development. Finding the optimum balance of these three pillars is the main challenge of sustainable development. Sustainable development concept that integrate the three pillars that consist of economic growth, socio development and environmental protection, includes long-term perspective to ensure well-being of the current and future generations.

2.3 Sustainable Construction

Sustainable Construction aims to reduce environmental impact of a building life cycle and inparalel to optimize economic feasibility, comfort and security of the users [11]. According to Ochieng et al (2014), sustainable construction is a form of sustainable development in construction sector. Sustainable construction refers to the usage of different construction methods (from the conventional ones), whereby the method produce lesser environmental impact. Based on Bal, Fearon and Ochieng (2013), a construction can be called sustainable when it can meet environmental challenges, responsive to socio-cultural needs, and create economic improvement. Suliman and Omran (2009), stated that sustainable construction was a series of process when beneficial and competitive Industry created assets (in form of building, structure, infrastructure and surrounding environment) which improves quality of life and offers customers satisfaction, flexibility and potency to fulfill users changes in the future, provide and support socio and natural environment demands, and maximize efficient usage of natural resources. Sourani and Sohail (2011), explained that sustainable construction was a matter of achieving balance between socio, economic and environmental aspects of a construction process to meet optimum cost and benefits evaluated to those three aspects. Hence, it can be summarized that sustainable construction is a series process of construction that is done to meet socio, cultural and economic demands as well as meeting environmental challenges to ensure well-being of current and next generation needs.

According to Houvila et al. (1998) in Delnavaz (2012), sustainable construction is a response of construction industry to the sustainable development. Houvila developed a diagram that explains problems as a basis of the need of a sustainable development which responded by construction industry with sustainable construction. In the process, sustainable construction is a sustainable development process with end result is a city and sustainable buildings with better environment and higher quality of life. The diagram can be seen in figure 2.2.
Kibert in Shen (2007) introduced 7 (Seven) principles of sustainable construction implementation, i.e.: conserving which is minimizing natural resource consumption, reusing which is maximizing reuse of natural resource, renewing/recycling which is reuse sustainable resource or recycle resource, protecting the nature which is protecting the true nature, usage of non-toxic substances to create healthy and nontoxic environment, economic benefits which are analyzing life cycle costs and providing quality products.

Based on United Nations Environment Program (UNEP) in Bal, Fearon, and Ochieng (2013), sustainable construction must have 5 (five) characteristics. The first one was that sustainable construction must be designed and maintained routinely to optimize overall life cycle. The second characteristic was sustainable consideration and prerequisite must be done in law maker and standard. The next characteristic was environmental aspect must be considered in the project and must include short-term and long-term aspects. The fourth characteristic was policy and incentive provided by the government must support sustainable construction and development. The investors, insurance companies, property developers, and buyers must realized sustainability and must actively involve promoting sustainable construction and development.

Sustainable construction involves commitment to gain sustainability of economy, environmental and social. The sustainable economic means profitability improvement with better efficiency in resources, including manpower, material, water and energy. Sustainable environment is created by avoiding dangerous and unreformed effects to the environment by using selective natural resources, minimizing waste and protecting and enhancing the environment. Socio sustainability means responding to the community needs in every stage of construction, increasing higher customers satisfactions and cooperating with clients, suppliers, workers, and local communities[22].

Hussin, Rahman, and Memon (2013) described sustainable construction approaches that consist of three main aspects i.e.: economic, socio and environmental aspects. Sustainable approaches in economic aspect includes life cycle costing, internalization of external costs, considering alternative funding mechanism, developing proper economic instruments to promote sustainable consumption, and rationalizing economic impacts to the local structure. Within socio aspect, sustainable approaches covers increasing participative approaches by involving stakeholders, supporting public involvement, supporting appropriate institutional development framework, considering influence to the existing social framework, and evaluating impacts to the healthy and quality of life. The sustainable environment includes improvement in material efficiency by reducing non-renewable resources demand, reduce material intensity through alternative technology, increase recycle, reduce and control toxic material usage and transmission, reduce energy requirements to change and supply material and services, support legal instrument and international convention, maximize usage of sustainable and renewable bio resource, consider impact of the project to the water, air, soil, flora and fauna.

According to Anom in Antombo (2015), sustainable construction referred to the construction process which is environmental friendly and economically as long as building’s lifecycle. Sustainable construction combines recycle aspects of the building lifecycle, in this sense, resource usage and resulted impacts to the environment from the design stage, construction, operation, maintenance, renovation and through to demolition stage of the building.

According to Atombo (2015), benefits of integrating sustainable construction in project management can be described as follows:

1. Environmental benefits with increment of air and water quality, minimize water and energy consumption, and reduce waste, stabilize climate, protection of ozone, conserve natural resources, open air, protection of habitat and bio diversity.
2. Economic benefits by reducing maintenance and operational costs, income increment (from selling and rental value), energy efficiency and natural resource conservancy.
3. Socio benefits with increment in comfort and resident health

2.4 Image of Building Construction Project in Jakarta

Although impacted by the economic crisis in 1997/1998 and 2008, Jakarta recovers and continues the Developments. Up until 2015, 13 skyscrapers with more than 200 m in height were recorded [24]. In 2016, 128 skyscrapers completed
with 200 m minimal in height [8]. If all developments align, Jakarta will be having at least another 10 high-rise building higher than “Wisma 46” in 2020[4].

In 2016, Provincial Government of Jakarta predicted that over the next 30 years, uncontrollable building construction will occur. The condition will bring environmental damage to the Capitol. According to the deputy governor of Jakarta, Djarot Saiful Hidayat (2016), the Capitol main issue was the environment [69]. If building development do not control by green building regulation, Jakarta is at risk of underwater with uncontrollable environmental friendly developments. Green building regulation is expected to control, regulate and monitor various buildings in Jakarta, especially to stringent the issuance of building’s functionality permit.

To control the high-rise building developments in Jakarta, the Jakarta Provincial government issued Governor Regulation no 38, 2012 regarding regional action plan to reduce greenhouse gas emission. The regulation stated the building coverage ratio (BCR) and environmental friendly building design by accommodating green building design. This regulation is in conjunction with the existing Governor Regulation no 38, 2012 that regulates green building.

2.5 Stakeholder involvement in Building Construction Project

In general, involvement of stakeholders in a construction project can be categorized in two ie. service users and assignees. Service users can be the client known as assignor and users. While assignees include design consultants, contractors, sub-contractors, suppliers and vendors who accept the assignment to complete parts of construction project.

The client is a body or an institution that owns the project or work and assign to other parties who are capable to deliver according to the work agreement. To reach the project, the client has main responsibility to provide enough resource to fund the project starting from the design up to the project completion. The client has to do project administration works, nominee and assign to the consultants and contractors involved in the project, urge responsibility form the supervisory consultant or construction management, as well as receive hand-over from the contractors.

A design consultant is a body or an institution assigned by the owner to do a design work. In construction project, there are numerous consultants such as structural consultant, architectural consultant, services consultant (mechanical, electrical and plumbing consultants). These consultants responsible to complete a design according to the owner needs, projected ideas or wishes of the owner into a building design, connected site condition to the owner wishes, prepare construction drawings, prepare planning and specifications as construction guidelines, prepare budget plan, revise the design according to the site condition, and responsible to the design if there is failure to the construction.

The contractors are the parties assign by the client to do the construction project according to their skills. The contractors responsible directly to the client and supervise by a team assigned by the client and can consult with the supervisory team if necessary during the construction works. The Contractors must do the construction work according to the regulation and following the specification that is planned and agreed in the agreement with the owner. The contractor is responsible for the submission of progress reports covering daily, weekly and monthly reports to the owner. The reports include work activities, work progresses, manpower, material delivery, weather condition, problems occur in the site and other supporting data. The contractor responsible in providing necessary manpower, material, equipment and other supporting tools, and stockyard according to the specifications and designs by considering time, cost, quality of work and safety. The contractors are also fully responsible to the construction works and method on site. The contractors must follow the agreed schedule, secure all the equipment, material and works up to the handover to the owner, maintain and recover all damages to the access and surrounding environment at their own costs due to works as part of their responsibility and liable to the loss due to accident during the construction period.

The client holds an important role in a project. According to Rafindadi et al. (2014), role of influences of parties involved in a project decided the end result of a project. In sequences these parties are the Client, Designer, Contractor, Engineer, Planner, User/Operator, and Community Representatives. Munns and Bjeirmi (1996) stated...
that the Client as an assignor responsible for the creativity process in identifying ideas in a project.

2.6 Risk Factor and Variable inhibit the sustainable construction

Application of sustainable development in building construction project poses its own challenge resulted in slower pace of sustainable development especially in developing countries. Previous studies had tried to identify the factors that inhibit the application of sustainable development in construction sector.

United Nations Environment Program (2003) stated that the main issue and challenge of sustainable construction consist of management and design aspects, consumption of resource and energy, urban eco-efficiency, urban energy efficiency, and planning and decision making process. Challenge related to the management and design aspects include demands and expectations of building owners and clients not always taking into account energy efficient building criteria, lack of awareness and knowledge of planners, designers and engineers regarding energy and resource efficient building solutions, lack of public awareness and involvement, inadequacy of standards, regulations and decision making processes, and limitations within the design process itself.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Variable</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. Human Resource</td>
<td>Lack of professional skills/capacity</td>
<td>2, 3, 4, 9, 10 X10</td>
</tr>
<tr>
<td></td>
<td>Lack of education and knowledge of sustainable design.</td>
<td>4         X11</td>
</tr>
<tr>
<td></td>
<td>Lack of experience in sustainable construction</td>
<td>9, 12     X12</td>
</tr>
<tr>
<td>D. Technology</td>
<td>Limited available information regarding the technology application and environmental friendly material</td>
<td>3, 9   X13</td>
</tr>
<tr>
<td></td>
<td>Limited supplier of technology and environmental friendly material</td>
<td>3, 9      X14</td>
</tr>
<tr>
<td></td>
<td>Lack of availability of proper environmental friendly technology</td>
<td>3         X15</td>
</tr>
<tr>
<td></td>
<td>Lack of environmental friendly material</td>
<td>4, 6      X16</td>
</tr>
<tr>
<td></td>
<td>Uncertainty of sustainable technology performance</td>
<td>3         X17</td>
</tr>
<tr>
<td></td>
<td>Misunderstanding of sustainable technology application</td>
<td>3         X18</td>
</tr>
<tr>
<td></td>
<td>Lack of integration and correlation in the industry</td>
<td>1, 2, 11  X19</td>
</tr>
<tr>
<td></td>
<td>Lack of research and development</td>
<td>1, 7, 8, 9, 11 X20</td>
</tr>
<tr>
<td>E. Technical</td>
<td>Lack of sustainable tools</td>
<td>1, 3, 4, 5 X21</td>
</tr>
<tr>
<td></td>
<td>Lack of sample project</td>
<td>1, 4      X22</td>
</tr>
<tr>
<td></td>
<td>Lack of construction process guideline that is easy to access</td>
<td>4, 9      X23</td>
</tr>
<tr>
<td></td>
<td>Lack of technical skill</td>
<td>4         X24</td>
</tr>
<tr>
<td></td>
<td>Hesitations of the involved stakeholders in the project to try new ideas due to its risk factors</td>
<td>10      X25</td>
</tr>
<tr>
<td>F. Politic</td>
<td>Lack of government regulation and policy</td>
<td>1, 2, 4, 5, 8, 9, 10, 12 X26</td>
</tr>
<tr>
<td></td>
<td>Lack of government incentive</td>
<td>1, 3, 6, 10, 11, 12 X27</td>
</tr>
<tr>
<td></td>
<td>Lack of government commitment</td>
<td>1, 4, 12  X28</td>
</tr>
<tr>
<td></td>
<td>Lack of building codes</td>
<td>3, 4, 5   X29</td>
</tr>
<tr>
<td></td>
<td>Lack of strategy to promote sustainable construction</td>
<td>5         X30</td>
</tr>
</tbody>
</table>

3. RESEARCH METHODOLOGY

This study was using quantitative method by using questioners and involving owner as study despondences. Study factors and variables were established based on theory and relevant researches. Ten (10) factors were identified with total of 42 variables used in questioner disposition. The questioner was answered with likert-type scale from 1 to 5 with 1 as strongly disagree and 5 as strongly agree. Factors and variables used in this study can be seen in the following table.
4. RESEARCH DISCUSSION

Based on correlation analysis, there were 26 variables with r value >0.4 (r>0.4). These 26 variables were then used in inter-correlation analysis to get 10 variables used in the next analysis. These variables were presented as follows:

<table>
<thead>
<tr>
<th>No.</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>X5</td>
<td>Lack of proper understanding of sustainable construction</td>
</tr>
<tr>
<td>X11</td>
<td>Lack of education and knowledge of sustainable design.</td>
</tr>
<tr>
<td>X14</td>
<td>Limited supplier of technology and environmental friendly material</td>
</tr>
</tbody>
</table>

The regression results of 10 variables above are presented below:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Awareness</td>
<td>Client lack awareness</td>
</tr>
<tr>
<td></td>
<td>Professional lack awareness</td>
</tr>
<tr>
<td></td>
<td>Public lack awareness</td>
</tr>
<tr>
<td></td>
<td>Lack of awareness and benefit of Sustainability</td>
</tr>
<tr>
<td>B. Resource</td>
<td>Lack of proper understanding of sustainable construction</td>
</tr>
<tr>
<td></td>
<td>Unclear definition and misinterpretations</td>
</tr>
<tr>
<td></td>
<td>General perception that sustainability requires big budget</td>
</tr>
<tr>
<td></td>
<td>Lack of knowledge of technology and environmental friendly material</td>
</tr>
<tr>
<td></td>
<td>Lack of information regarding the associated cost and benefits of sustainable development</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reference</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>X1</td>
<td></td>
</tr>
<tr>
<td>X2</td>
<td></td>
</tr>
<tr>
<td>X3</td>
<td></td>
</tr>
<tr>
<td>X4</td>
<td></td>
</tr>
<tr>
<td>X5</td>
<td></td>
</tr>
<tr>
<td>X6</td>
<td></td>
</tr>
<tr>
<td>X7</td>
<td></td>
</tr>
<tr>
<td>X8</td>
<td></td>
</tr>
<tr>
<td>X9</td>
<td></td>
</tr>
</tbody>
</table>

The regression results of 10 variables above are presented below:
Based on correlation analysis, there were 26 variables with $r$ value $>0.4$ ($r>0.4$). These 26 variables were then used in inter-correlation analysis to get 10 variables used in the next analysis. These variables were presented as follows:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Variable</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>G. Finance</td>
<td>Fear of high investment</td>
<td>2, 3, 4, 5, 6, 8, 9, 10, 12, X31</td>
</tr>
<tr>
<td></td>
<td>Fear of high rate of return</td>
<td>4, 8, X32</td>
</tr>
<tr>
<td></td>
<td>Client anxiety over profit</td>
<td>4, X33</td>
</tr>
<tr>
<td></td>
<td>Lack of finance</td>
<td>4, X34</td>
</tr>
<tr>
<td></td>
<td>Separation of budget and operational cost</td>
<td>1, 7, 9, 10, X35</td>
</tr>
<tr>
<td></td>
<td>Hesitation of benefactor to use innovative technology</td>
<td>10, X36</td>
</tr>
<tr>
<td>H. Time</td>
<td>Lack of enough time to solve sustainability problems</td>
<td>1, 3, 9, X37</td>
</tr>
<tr>
<td>I. Socio-Culture</td>
<td>Resistance to change</td>
<td>1, 2, 3, 4, 9, 10, X38</td>
</tr>
<tr>
<td></td>
<td>Lack of demand for sustainable products</td>
<td>1, 4, 5, 11, X39</td>
</tr>
<tr>
<td>J. Management/Leadership</td>
<td>Lack of leadership</td>
<td>4, X40</td>
</tr>
<tr>
<td></td>
<td>Lack of manager motivation, responsibility and aspiration</td>
<td>4, 10, X41</td>
</tr>
<tr>
<td></td>
<td>Delay in decision making</td>
<td>4, X42</td>
</tr>
<tr>
<td>Performance of building construction project in Jakarta</td>
<td>Performance of sustainable building construction project in Jakarta</td>
<td>Y</td>
</tr>
</tbody>
</table>

The regression results of 10 variables above are presented below:
Based on the above data, a regression model was established as follows:

\[
Y = -0.466 + 0.400(X_{25}) + 0.330(X_{5}) + 0.218(X_{35}) + 0.191(X_{40})
\]

With:

- **Y**: Optimum sustainable construction application in improving project performances
- **X_{25}**: hesitations of the involved stakeholders in the project to try new ideas due to its risk factors
- **X_{5}**: lack understanding of a good sustainable construction
- **X_{35}**: separation of budget and operational cost
- **X_{40}**: lack of leadership in construction project

The following is the description of dominant variables to the Y:

- **X_{25}**: Hesitations of involved stakeholders in the project to try new ideas due to its risk factors contribute 66.7% as inhibitors in application of sustainable construction in building project in Jakarta. Enhassi and Mayer (2005) identified hesitations of involved stakeholders in the project...
to try new ideas due to its risk factors as one of the main factors in sustainable construction application. This Factor can be caused by lack of data used by the construction industry actor as a guideline in sustainable construction application in building construction project. Lack of data can be caused by lack of research or sample of projects that has applied sustainable construction. According to Sourani and Sohail (2011), contractors who do not have access to the benefits of sustainable solution are hesitating to invest in sustainable solutions.

X5: Lack understanding of a good sustainable construction contributes 13.6% in inhibits the application of sustainable construction in building construction project in Jakarta. Ametepey et al. (2015) identified this factor as the main factor in sustainable construction application. Without proper understanding of sustainable construction, would be difficult to shape conscience of construction industry actors of the urgency of sustainable construction application. Abidin (2009) identified lack of understanding of sustainability and sustainable construction as one of the reasons of lower sustainability construction application. Many developers are trying to balance the three pillars in sustainable development according to their needs. Unawareness and misunderstanding of sustainability concept is one of barrier factors to the successful of sustainable construction application. Unawareness concept of sustainability resulted in low awareness of construction industry actors to the importance of sustainable construction. Thus, resulting in difficulty of the sustainable construction application due to no support provided from the community construction industry actors. To ensure the proper understanding of sustainable construction, it needs pronouncement to the construction industry actors and community through education institution and professional training.

X35: Separation of budget and operational cost contributes 4% as inhibitors to the sustainable construction application in building construction project in Jakarta. This separation can happen if the owner unaware of the overall life cycle project costing. Separation of budget and operational cost result the owner only focus on the lowest development cost that tends to overlook the operational costs. It is common to find that there are two separate organizations doing the construction in one side and operation on the other side, resulting in the overlook of overall lifecycle costs. In this case, the organization responsible to build tends to cut the development cost without considering the impact to the operational cost once the building is used. To ensure the successful of sustainable construction application in construction building project in Jakarta, life cycle costing needs to be considered as a whole and no separation between planned development budget and operational costs.

X40: Lack of leadership contributes to 2.2% in inhibit of sustainable construction application in building construction project in Jakarta. According to Ametepey (2015), leadership and management of construction industry and individual organization played an important role in the successful application of innovative strategy. Thus, to ensure the successful application of sustainable construction, leadership factor is important to be considered. Lack of leadership resulted in ineffective executions taken in a project to support sustainable construction. Without support, leadership and effective management in sustainable construction application, various problems may arise in the process.

5. CONCLUSION

Based on collected data and analysis done in this research, it can be concluded that:

1. Sustainable construction process in Jakarta building construction is a construction process that balances the socio, economic and environmental aspects in each and every stage to optimize the cost and gained benefits.
2. Factors that inhibit the application of sustainable construction in Jakarta building construction are as follow:
   a. Knowledge factor with Variable X5 ie. lack of proper understanding of sustainable construction
   b. Technical factor with variable X25 ie. hesitation of all parties involved in the construction project to try new ideas due to its own risk factors
   c. Financial factor with variable X35 ie. separation of budget and operational cost
d. Management/Leadership factor with variable X40 i.e. lack of leadership

3. To ensure the successful application of sustainable construction in building construction project in Jakarta, factors that inhibit in sustainable construction application must be eliminated. Based on research results, the factors are lack of understanding of a good sustainable construction, hesitations of involved stakeholders in the project to try new ideas due to its risk factors, separation of budget and operational cost, lack of leadership in construction project. Recommendations to eliminate those factors are presented as follow:

a. Formulizing proper understanding of sustainable construction
b. Establish researches to identified risks in the sustainable construction application and project samples. With sufficient data and project samples, it is expected that construction project actors are ensured in applying sustainable construction since the risks have been identified in the beginning and solutions can be found.
c. Establishment of overall project life cycle costing. With no separation of budget and operational costs, the owner is expected to balance the costs and benefits gained during the project cycle.
d. Lack of leadership in directing the project to sustainable construction application can be caused by the lack awareness and motivation of the leader in sustainable construction application. Since there is no responsibility in sustainable construction application resulting in lacking of leadership in directing the project to a project sustainability. Hence, to improve leadership in sustainable construction application, responsibility can be imposed to the application of sustainable construction. This can be achieved by applying the sustainable construction requirements in the regulation and building codes and standard.

6. RECOMMENDATION
1. Further study could include respondents from the assignee (consultants, contractors, suppliers) to gain broader picture of factors that inhibit the application sustainable building construction in Jakarta.
2. Further study could explore more detail of risk factors in sustainable construction application of building construction in Jakarta.

Reference
11. Construction Specifications Institute. CSI Practice Guides: The CSI Sustainable Design


64. United Nations Department of Economic and Social Affairs. Achieving Sustainable Development and Promoting Development Cooperation. Dialogues at the Economic and Social Affairs.


