GREEN CONSTRUCTION IN INDONESIA: DEVELOPMENTS, ISSUES, AND CHALLENGES

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ABSTRACT: As an effort to implement the sustainable construction concept in Indonesia, the government, particularly the Ministry of Public Works, adopted what so called a defensive strategy and took a leadership role among other stakeholders. The drafted agenda in sustainable construction that was issued by the government suggested other stakeholders to use the document as a reference in discussions to develop more detailed implementable agendas, and to develop strategic actions by all stakeholders as their contributions to the implementation of sustainable construction. More follow-up actions should be executed by the government and especially by the Ministry of Public Works in order to fortify coordination between government agencies, to lift up leadership role credibility, and to promote the champions in the area of sustainable construction. Whilst construction practitioners have developed green movements, such as green building and green contractor, the realization of the proper sustainable construction is still doubtful to be seen. The importance of operations or processes during construction in delivering the green or sustainable value of a construction product, such as building or other infrastructure, is not grasped adequately by stakeholders and still substantially missing in the available assessment systems for green building as well as for assessing the green contractor. Actions to take green movements in Indonesia into their proper tracks that would become effective incentives for achieving sustainable construction in Indonesia are still considered necessary, especially in the area of green construction.

KEYWORDS: construction operation, construction process, green building, green contractor, green construction, sustainable construction.

1. INTRODUCTION

The construction industry is one of the priority sectors to contribute in sustainable development because of the characteristics of the construction process which make the industry the point of departure for necessary changes. Construction industry produces the built environment and most of the infrastructure facilities have very long useful lives. Meanwhile, the construction process and the related activities consume the most natural resources and generate significant wastes. In Indonesia, construction sector contributes about 6% of the GDP and around 5% of national labors depend on this sector. Construction practices with better planning can contribute to the national energy savings. The energy need of the construction sector is estimated to continue to equal the growth of Indonesia's economy, which is in the region of 6%. As Indonesia's electricity is mostly generated by fuels, the global rising price/demand of fuel has made energy into a commodity that is increasingly expensive. Similarly, the construction process has a significant task in the perspectives of increasing water efficiency and minimizing waste. Thus, there is a real need to make changes in construction practices by implementing what so called sustainable construction.

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A formal initiative to implement the sustainable construction in Indonesia has been started by benchmarking activity, which was conducted by the Ministry of Public Works in 2009, to some developed and developing countries. The benchmarking activity was intended to compare baseline conditions, progress of development, and. achievements of each country in implementing sustainable construction, and then to formulate the challenges for Indonesians. All of the benchmarked countries were to embark on successful implementation of the sustainability issues in construction industry as a result of their value systems and cultures that are very conducive. Moreover, the successful benchmarked countries have been implemented the agendas of implementation properly for many years, and the achievements of the implementation were continuously monitored by an authoritative institution. Strong commitments from all stakeholders in construction sector to the agenda of implementation become one of their success factors besides the availability of effective indicators and assessment programs.

There are several challenges for Indonesia in establishing agendas of implementation in sustainable construction, such as the availability of reliable data related to sustainability issues that could be used as baseline for improvement; the availability of information on research activities and products related to sustainability issues; the need to have participations from all stakeholders to conduct initiatives in sustainable construction; strong commitments from all stakeholders to the implementation agenda; and coordination of stakeholders for orchestrated efforts towards effective sustainable construction agenda. Based on those challenges the Indonesian construction industry faced, it was suggested the implementation should focus on the following issues:

1. Moving from the already government-adopted weak sustainability approach to more integrated strong sustainability approach.
2. Improving public awareness in sustainable construction to be the primary driver that could answer other challenges in sustainable construction easier.
3. Research and development in construction design process, construction environment quality, re-engineering of development process, construction human resources, standard and code, and construction products.

The Ministry of Public Works had been launched what it is called a draft of Agenda 21 for Sustainable Construction in Indonesia (Goeritno, 2011). This draft agenda was a result of the two-year study conducted by the Ministry and several focus grouped discussions between the stakeholders of the Indonesian construction industry. The document itself was developed based on the document of the Agenda 21 for Sustainable Construction in Developing Countries by du Plessis (2002) with the national conditions in mind. The agenda was derived to achieving the three enablers, i.e., technology, institution, and value system enablers.

In that document, there are agendas that belong to the four groups of construction stakeholders, i.e., research and education institutions, construction practitioners, owners, and the government, and also there is an agenda that should be implemented by the Ministry of Public Works which is meant to be the prime mover of other stakeholders' agendas. All of those agendas are to be implemented immediately (short term, from 2011-2017), for medium term (2011-2024), and in the long run (2011-2030). This timeframe of implementation was determined based on the priority and how much efforts needed to implement. At the end this timeframe is also synchronized with the National Construction Industry Agenda 2030 (Suraji, 2007).

The Ministry of Public Works promoted and suggested the draft Agenda 21 for Sustainable Construction in Indonesia be used by other stakeholders as an initial document to be referred in discussions to develop more detailed and implementable agendas. Moreover, the document should also be a reference for developing strategic actions by all stakeholders as they have the same vision on what each party should contribute to the implementation of sustainable construction.

2. STRATEGIC ISSUES FOR IMPLEMENTATION OF SUSTAINABLE CONSTRUCTION AGENDA

CIB (1999) suggested the use of four possible strategies for change towards sustainable development that were listed in a UK Report's "The Greening of Industry for a Sustainable Future," published by the Advisory Council for Research on Nature and the Environment and the Greening of Industry Network in 1997. The strategies were proposed to provide a framework for analyzing the opportunities which could be taken by construction industry of any countries. The strategies are: the "defensive" strategy: complying with regulation; the "offensive" strategy: beyond compliance; the "eco-efficiency" strategy: win-win solution for reducing environmental impacts and cost; and the "sustainability" strategy: the ideal strategy and holistic approach.

Based on previous analysis on the existing conditions and practices of the Indonesian construction industry, and referring to the CIB's proposed strategies for change, the "defensive" strategy is considered to be the most appropriate strategy for Indonesia. The defensive strategy is very typical response from the majority of construction practitioners who are driven mostly by regulations to improve their quality of products. The majority of the Indonesian construction industry's stakeholders still have low level of environmental awareness and understanding, even though there would be some notable exceptions. In their view, the cost of addressing the sustainability issues to their products is considered as the cost of compliance with the regulations and minimum standards. Therefore, the cost of non-compliance becomes the primary motivator for any improvements. The construction industry's stakeholder will continue to follow this situation until the market changes its demand for sustainability issues. In this defensive strategy, any government-led initiatives, by incentives or regulations, should be put first and have significant portion and priority in the implementation.

For the last three years, the Ministry of Public Works has worked on formulating the strategic issues towards implementation of sustainable construction in Indonesia. The defensive strategy was then definitely utilized in the case of Indonesia, since the market's demand on sustainability issue is still considered low and the construction industry always await regulations from the government to step forward on any important issues. In this situation, it is very important that the Ministry of Public Works have an agenda of the implementation that could be well accepted and effectively supported by all stakeholders. However, several strategic issues for implementation of sustainable construction in Indonesia have been identified as follows:

1. **Adoption of Agenda 21 for Sustainable Construction in Developing Countries.** It is strongly recommended that the Ministry of Public Works adopt the already available international agenda in sustainable construction to be implemented in Indonesia, i.e., the Agenda 21 for Sustainability Construction in Developing Countries (du Plessis, 2002). This is due to the fact that there are a lot of similar existing sustainability conditions in Indonesia that also characterized the developing countries, despite the fact that some conditions in Indonesia are better. Research and development agenda, as well as the strategy for actions recommended in the Agenda 21 for Sustainability Construction in Developing Countries are also relevant. It means that Indonesia will have a research and development agenda to fulfill three enablers and strategies for actions for each sector of stakeholders as mentioned in the adopted agenda.
2. **Immediate Action.** The Ministry of Public Works should prepare a strategy to gather all willing stakeholders and to embrace them to have the same commitment and spirit stepping forward together to implement the associated agenda and actions in practice. A nation-wide consensus among the stakeholders is needed in developing and implementing the agenda and actions.
3. **Performance Indicators.** The adopted agenda is only a framework of planning and developing more implementable actions to be identified by each relevant stakeholder. Therefore, more detail actions need to be developed and should be set as part of the

consensus among stakeholders. Furthermore, in order to assure the high level of implementation of the adopted and developed agenda and actions, several performance indicators are needed to be identified to measure the achievement of the implementation and set as continuous monitoring and evaluation program. It is also suggested that these performance indicators are not only set to measure the achievement of R&D agenda and strategies for actions, but also to measure the achievement of sustainable construction in Indonesia in comparison to the ideal.

The drafted agenda, called Agenda 21 for Sustainable Construction in Indonesia (Goeritno, 2011), tried to address all of those issues. The Agenda has been launched by the Ministry of Public Works, and it was also declared that the Ministry of Public Works, as a representative of government, should be the leader among all Indonesian construction industry stakeholders in the implementation phase of the agenda. Several focused group discussions and workshops to disseminate the agenda have been done since early months of 2011. Yet, the responses from stakeholders were not as much as expected. At the beginning of 2012, an evaluation on the effectiveness of the previous year dissemination activities of the drafted agenda was conducted. It was found that the not-so-good responses from stakeholders are due to the following conditions:

1. The government, as a regulator, enabler, and facilitator, in Indonesia is not only the Ministry of Public Works. Problems of coordination between ministries related to construction supply chain in Indonesia, as well as, related to sustainable development, existed and made a non-conducive atmosphere for the implementation.
2. Moreover, it seems that the Ministry of Public Works is considered not yet credible enough to be the leader among the government agencies due to lack of previous practices, policies, and experiences in promoting the sustainability issues in construction industry.
3. Existed champions in sustainable construction are not adequately supported and promoted by government yet.

Based on those findings, in year 2012, the government agencies related to construction and sustainable development has begun to coordinate more effective under what so-called a joined secretariat. Nonetheless, this secretariat still needs higher-level thrust to support their inter-ministry coordination and activities. Moreover, the Ministry of Public Works has been conducting many programs in disseminating the sustainable construction concept to all regional and municipal public work agencies in Indonesia and investing a capacity building program and human resource development in sustainable construction for its managers and technical staffs. Some notable activities that have been done in 2012 and will be done in 2013 are:

1. Development of manual for delivering green construction projects in public sector
2. Development of needed standards/codes for supporting green construction
3. In-house trainings of green construction for manager and technical staffs
4. Dissemination of sustainable construction concept to public works agencies
5. Development of green road rating system
6. Development of green public procurement system for infrastructure
7. Study on risk management of green construction project
8. Study on the readiness of green construction supply chains
9. Development of information system to support implementation of sustainable construction in Indonesia

3. AGENDA FOR GREEN CONSTRUCTION IN INDONESIA

The document of Agenda 21 for Sustainable Construction in Indonesia also put emphasis on the importance of construction processes and products in the implementation of sustainable construction during the process of construction; recently this is called more often as green construction. In this case,

the designers and, especially, constructors play very important roles. It is said that the designers and constructors should have programs, in short-term as well as medium and long term, to address the improvement of their construction practices and products, such as:

1. **Design Process**. Construction design, both product design and process design, should be environmental friendly and involved as many parties as possible in earlier stages.
2. **Construction Environment Quality**. Construction field is considered to be unique compare to manufacturing production location. Hence, temporary organization with unique working environment makes the management of the environment quality is not stable and rather difficult.
3. **Re-engineering of Development Process**. Innovations to the development processes, such as re-engineering, are encouraged to provide more eco-efficient processes through the life cycle of the development.
4. **Construction Products**. Products related to components of a construction should also be produced by ecological way. The embodied energy to produce the products should be minimized. During the assembly on construction site, the operation should also minimize the use of energy as well as the consumption of the natural resources.
5. **Human Resources**. Construction process needs to be performed by adequate and multi-skilled human resources. The needed human resources should be capable to adopt new technology and material that satisfies the criteria of sustainability.

Moreover, to implement the sustainable construction, the education is aimed to improve the awareness and understanding of all of construction stakeholders and to provide professional human resources in construction. Another important issue is the availability of standards/codes. It is a real and immediate need to have a proper standard and codes that will guide the practitioners in construction to implement the sustainability issues. The standards and codes should be developed based on the local wisdom that utilizes local resources.

Since the practices of doing research and development in construction firms are considered low in everywhere around the globe, nonetheless in Indonesia, the most important issue here is how to improve the research and development activities, since they are considered as the main gate to innovations. Supports from all of stakeholders to embrace the research and development related to sustainability issues in construction should be addressed firmly. The capability of research and development of construction firms in Indonesia should be elevated through effective collaboration between the construction firms and universities or research institutes.

4. RECENT GREEN CONSTRUCTION DEVELOPMENTS

While the government has set an initial and necessary initiatives in implementing sustainable construction in Indonesia, the practitioners has also been beginning to consider sustainable practices, especially in the area of green buildings. It seems that ’green’ terminology is more tempting to be used instead of ’sustainable’, and buildings are more controllable compared to other types of construction.

Some large contractors, as the main subjects in the construction field, had shown their awareness and stewardships to the environment by declaring themselves as green contractors. They have implemented reduce, reuse and recycle (3R) principles, as well as the reducing the use of energy in their construction projects. International certifications for environment management (ISO 14000s) have been their marketing weapons besides the certification of health and safety management from OHSAS nowadays. The practices of reducing the use of papers, catering waste, the use of air conditioning, the use of water and electricity has been their day to day operation in their project sites. Moreover, they tried to introduce their innovations in transportation for project’s labor, the use of alternative materials that are environmental friendlier, such as plywood, aluminum, light weight steel, and precast concrete.

Recently, there was a study conducted by the Ministry of Public Works that was aimed to measure the readiness of Indonesian large and medium-size contractors to implement the sustainable construction. In general, they are ready to implement the sustainable construction concept with the average score of 74, out of 100 (more on the methodology of the assessment system could be found in Wirahadikusumah and Ario, 2012). However, there are big differences in score of readiness for contractors that are located in Java Island and the ones that are not. The large and medium contractors located in Java are more ready since the demand to implement the sustainable construction is higher from the owner of the projects. This findings is, of course, very encouraging for the implementation of sustainable construction in Indonesia, but it is also shown that only maximum 10% of the registered contractors in Indonesia that are ready, while the rest (90%) are small-size contractors and they would have lower level of readiness.

One of other prominent movements in sustainable construction in Indonesia is the establishment of Green Building Council Indonesia (GBCI) in 2008. This is a not-for-profit and independent organization established by 50 core founders, who were individual professionals and practitioners, and 20 corporate founding members. Those founding persons and organizations are developer, designer, architect, building and facility management, contractor, supplier, architects, mechanical and electrical engineer, interior designer, and landscape. The GBCI is also representing the World Green Building Council (WGBC) in Indonesia. Until now, there are more than 120 corporate members joined this organization, one new green building projects and one existing building that had received platinum level of certification, and there are more than 16 green building projects that had received design recognitions. The assessment system that is published by the GBCI is called Greenship rating tools which consists of three rating tools: for new buildings, for existing buildings, and for interior spaces. The rating categories of Greenship for new buildings are:

1. Appropriate site development (ASD)
2. Energy efficiency and conservation (EEC)
3. Water conservation (WAC)
4. Material resources and cycle (MRC)
5. Indoor air health and comfort (IHC)
6. Building and environment management (BEM)

On the other hand, the government, represented by the Ministry of Environment, has issued a regulation on criterion and requirements for an institution that could publish an assessment system for certifying green buildings in Indonesia. At the end of 2012, the government, represented by the Ministry of Public Works, would also be issuing a standard of green building in Indonesia as a complementary of the previous regulation. In fact, starting this year, in the city of Jakarta, as the capital city, green building certification is a mandatory for new as well as existing buildings based on the Governor Decree. Even though the requirement to adopt green building concept in Jakarta is considered mandatory, it is a minimum level of green specifications that are achievable and processed as part of getting building permits for new buildings and operation permits for existing buildings.

Furthermore, green contractors in Indonesia already had their own assessment systems to measure the level of greenness of their projects. As an example, P.T. Pembangunan Perumahan (PP), the pioneer in green contractor in Indonesia, has an instrument that is called Green Contractor Assessment Sheet. This sheet is a form-based assessment for measuring the following categories:

1. Appropriate site
2. Energy efficiency and conservation
3. Water conservation
4. Site environment management
5. Material sources and cycle
6. Site health and comfort.

Other green contractors have their own systems that are slightly different but most of them have the same principle categories of measurements.

Other movements related to green construction in Indonesia is coming from the universities with their research agendas. Advanced researches in the use of recycle materials, especially concrete since it is the major construction material in Indonesia, have been done several years ago and this time is the time to realize the benefit of this kind of research to the construction projects. The high volume fly ash (HVFA) concrete, geopolymer concrete, recycle aggregate concrete, and pervious concrete have been very exciting fields of research areas recently. Some applications have been seen in the construction projects in Indonesia. Moreover, some researches to support the implementation of sustainable construction in Indonesia have also been conducted and they will support the development of necessary green supply chain system for construction in Indonesia (Abduh and Fauzi, 2012a).

5. IMPROVEMENTS NEEDED FOR GREEN CONSTRUCTION INNITIATIVES

Besides enthusiasm from seeing the recent conditions of Indonesia in implementing sustainable construction, some issues should be addressed as a result of some studies conducted recently on the assessment systems, i.e., green building certification and also green contractor assessment. Those assessment systems are formal products that are available nowadays and could govern most of the practitioners in Indonesia. Even though the government has stepped into the playing field, especially for green building assessment, to influence the direction of initiatives, the practices still heavily focus on the design phase of the building. Whilst, the green contractor assessment tools also have their focuses on the way the contractors practicing their house keeping works on site. Those assessment systems were developed to be implementable easily and then to award the predicate to the assessed parties or projects. They are mostly document-based systems. So, they just become exciting new businesses, and seem to be a monopoly since those assessment systems are the only one available, and the first one to be developed in Indonesia.

While they measure many categories of green buildings and green construction, they are not intended to measure how green operations and processes are during the construction phase. Those assessments systems would be beneficial only to develop green designs as well as green house keepings and behavior during construction, but they lack of incentives for the contractors to search for innovations of their operations during construction. For some green projects or green buildings, they might get the green design recognitions and are constructed by green contractors, but the contractors should deploy the project acrobatically in order to fulfill the green specifications already recognized. The contractors' acrobat considerably will produce waste all the time during construction. At the end, the green construction projects may not be green anymore, even though they received green certifications afterward.

By analyzing the categories used in the Greenship for new green building, there are only 4.5% of them are related to assessing the operation during construction. The rest categories are related to building design (62.2%) and operation of building (33.3%) (Ervianto et.al. 2011). This findings showed the emphasis of this rating tool more to design and operation of green building compared to construction process of the building itself. Moreover, Abduh and Fauzi (2012b) studied the process of assessment using Greenship in a real case study of green building project. It was found that the categories related to the operation and process during construction, i.e., material resources and cycle category and building environment management, are hardly to be implemented properly due to unsupportive construction supply chains in Indonesia to the green movements and lack of inspection activities during construction in a document-based assessment system like Greenship. The green contractor assessment sheet lacks of the same issues of the Greenship, since its categories are very comparable to the Greenship's.

Those findings showed an improvement opportunity for the construction practitioners in implementing green construction in Indonesia. The assessment system, even though it is not the most important thing, eventually could give incentives and drivers for changing the practices. Therefore, an improvement of the available assessment systems related to the green construction should be introduced and developed.

In principle, the assessment of green construction should begin with the individual behavior and contractor organization practices. This aspect is called Green Behavior and Practices (GBC) (Abduh and Fauzi, 2012b). The big challenge for the contractor to implement this aspect is related to how to manage paradigm shift of the individual and changes in the organization to be greener. In the assessment system, this category should measure how well the contractor personnel behave in a green way and how well the contractor organization introduce the green practices as an standard operating procedure.

Other aspect to be considered in delivering green construction is related to the operations or processes of construction itself at the field. This is a production problem. Therefore, the operations or processes of construction at the field should minimize waste and on the other hand should maximize value to be delivered. This aspect is called as Green Construction Processes (GCP). However, this aspect is already known as lean construction principle. In the assessment system, this aspect should be addressed by measuring the waste produced by each operation or process of construction in the field and how good is the achievement to the value defined by the succeeding operations or processes and the final customer (Abduh and Fauzi, 2012b).

The last but not the least, there is another aspect that is very important to support two previous aspects of green construction, it is called Green Supply Chains (GSC). This aspect is important due to construction operation or process need materials as the major input for transformation to the final product of construction. The green materials should be managed by a proper green supply chains. Every member of the construction supply chains should contribute to the achievement of green value defined by the final customer. In the assessment system, therefore, there should be categories to measure the process of procuring green suppliers and how good their performances are (Abduh and Fauzi, 2012b).

6. CONCLUSION

Indonesia has analyzed the possible implementation of an agenda for national movements in sustainable construction. Different stakeholders in Indonesia have established the starting point to embrace sustainable construction principles. While the barriers for effective implementation are complex, a defensive strategy has been adopted by the government. The draft of a national strategy had already been disseminated through the assistance of various groups: the wider sectors within the government, the academics, and the professionals. Yet, national consensus requires persistent efforts by these concerned groups.

The majority of the Indonesian construction industry's stakeholders still have low level of environmental awareness and understanding, even though there would be some notable exceptions. In their view, the cost of addressing the sustainability issues to their products is considered as the cost of compliance with the regulations and minimum standards. Therefore, the cost of non-compliance becomes the primary motivator for any improvements. The construction industry's stakeholder will continue to follow this situation until the market changes its demand for sustainability issues. In this defensive strategy, any government-led initiatives, by incentives or regulations, should be put first and have significant portion and priority in the implementation.

Moreover, any initiatives from all stakeholders should be embraced, supported and guided, as much as possible by the government. Yet, they are not only beneficial to only parts of concerned group in

Indonesian construction industry, but they should also become incentives for other parties to join the implementation of sustainable construction in the right and meaningful directions.

Green construction movements, as one of the example of implementation effort of sustainable construction, should be directed to the proper understanding of the importance of every single phase and stakeholders in the value chain of sustainable construction. Construction operations and processes in the field are important as much as other phases of construction, therefore, more attentions from all of stakeholders, especially for research and development, should be put to deliver the green construction in a proper and meaningful way. Three aspects of green construction, i.e., green behavior and practices, green construction processes, and green supply chains, should be addressed adequately.

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