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Indonesian Theme Paper

Sustainable Construction Policies and Market in
Indonesia

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1 Executive Summary

It has been more than four years, a promising development of sustainable construction and other green movements in Indonesian construction industry were reported in the 18th Asia Construct conference in Singapore. However, the development pace has been slower than it was expected, even though many key stakeholders have been playing their roles enthusiastically. It seems that the critical mass was not built yet in the Indonesian construction industry and its supply chains to support the development.

In this theme paper, recent development of sustainable construction initiatives from construction industry stakeholders were updated. The progress of sustainable construction initiatives and constraints faced by the stakeholders were also presented. With recent high growth of construction industry's contribution to the Indonesian GDP, i.e., around 10.4%, all participants of the Indonesian construction industry are under pressure to deliver the construction products with tight scheduled target. This situation will put the sustainable construction initiatives out of the main participants' focuses for a while. Although there are policies and incentives for conducting construction in a sustainable way, they may not be relevant in that hectic situation.

Considering the slower pace of sustainable construction development in Indonesia construction industry, it is suggested that further development of the sustainable construction initiatives would be toward capacity building of the Indonesian construction supply chains. The need for engineers and managers for doing sustainable construction businesses is the most problematic one in Indonesia. Moreover, the specialist sub-contractors and suppliers, that are aware of and practicing sustainability principles in their businesses, are to be developed further to provide a competitive sustainable construction market. However, any implementation of sustainable construction in Indonesia still to be a led government activity. In this case, a focused agenda of implementation in completing the system and necessary regulations as well as in building the Indonesian construction supply chains' capacity to support the implementaion is needed.

2 Main Issues with Construction Industry and Market

(1) Indonesian Construction Market

It is reported that two last years' GDP contribution of the Indonesian construction industry reaching more than 10%, and it is considered to be one of the largest in the world. Since the last ten years, with a growing population of more than 250 million, huge infrastructure spending and rapid urbanization, Indonesia could be considered as highly developing country. Its GDP, around \$895 billion, is forecasted to grow by up to 10% per year in the next five to ten years, and the construction for sure will play a leading role in it. The Indonesia's government will spend about \$450 billion on infrastructure alone until 2020, with over \$22 billion of confirmed spending for 2016 (Trading Economics, 2016).

It is forecasted that the Indonesian construction industry will grow 7.2% and 7.3% in

2016 and 2017 respectively, with the residential and non-residential construction to hold the strongest annual growth rates. The more promising area for investment in Indonesia is meeting the housing demands for more than 250 million people. This construction growth is being driven at any level of society. The top-level consumers and upper classes are demanding high-quality finishing materials in larger quantities; greener, safer and more efficient materials. There is a million-unit house-building program enacted in the City of Jakarta and other urban areas.

Besides, many infrastructure construction projects are already planned, such as: building bridges, ports, roads, railways and super express transits (over \$30 billion); fuel and chemical distributors for two new power plants; new National Health Insurance Program to build over 150 new hospitals; Global Smart City project costs \$15 billion; investment of over \$4 million in 10 to 12 new megastores; investing \$300 million for renewable energy sources, biomass, geothermal plants, and hydroelectricity plant (Konstruksi Indonesia, 2016).

(2) Indonesian Sustainable Construction and Green Buildings Market

As reported by Abduh et.al. (2012), the prominent movement in sustainable construction in Indonesia is the establishment of Green Building Council Indonesia (GBCI) in 2009; it is representing the World Green Building Council (WGBC) in Indonesia. The assessment system that is published by the GBCI is called Greenship rating tools, a voluntary green ratings tool to evaluate the environmental design and construction of buildings, which consists of three rating tools: for new buildings, for existing buildings, and for interior spaces. The tool measures buildings in six categories: land use, energy efficiency, water conservation, source materials, air quality and environmental management.

As of 2015, there were 140 buildings in Indonesia registered to be assessed for green building certification. However, until July 2015, only 14 buildings have received the certification. The assessment process for certification was considered as a lengthy process; it takes about 6 to 12 months depending on the complexity of the building's design. The GBCI found that even though more buildings are registered for certification, the certification process is not as good as predicted. Only few, about 20%, applicants are able to meet the requirements, e.g., legal documents, testing & commissioning certificates, documents' validation and verification, and on site observation. The need for experts, i.e., Green Professionals (GP) and Green Associates (GA), in helping the assessment process of the green building certification was also identified from the GBCI's side and also from the owner's and engineer's sides. Based on this progress, the green building certification in Indonesia is still lagged behind compared to other Asian countries.

Moreover, even though, it has been four years since the Jakarta's Governor Decree No. 38/2012 about green buildings was issued, there were only few new buildings in Jakarta

that could meet the requirements of this green building regulation. The developers of new buildings must comply with a maximum energy consumption of 45 watts per m², optimizing natural lighting, having a minimum indoor temperature of 25°C for minimizing air conditioning, and treating and re-using wastewater. Based on data collected from the Council of Integrated Permit Services (BPTSP), there are no more than new 10 buildings that had complied with the Governor's decree. Some developers of new buildings argued that the regulation is too strict in term of the limitation of total floor area to achieve an economic feasibility; minimum of 50,000 m² of total floor area for apartment, office and commercial buildings, minimum of 20,000 m² of total floor area for hotel and medical facilities, and minimum of 10,000 m² of total floor area for educational buildings. Moreover, issues of the availability of assessors in responding the implementation of the decree is questionable.

(3) Main Issues for Implementing Sustainable Construction

The promising development of sustainable construction and other green movements in Indonesian construction industry were reported in the 18th Asia Construct conference in Singapore, in 2012. However, the development pace has been slower than it was expected since then, even though many key stakeholders have been playing their roles enthusiastically, especially the Indonesia government and the GBCI. It seems that a critical mass is not built yet in the Indonesian construction industry and its supply chains to support the implementation of sustainable construction.

Some issues that may cause the slow pace of the implementation of sustainable construction in Indonesia had been identified (Abduh et.al. 2012, Abduh 2014):

1. There is no adequate master plan for the implementation. The drafted agenda launched by the Ministry of Public Works, called Agenda 21 for Sustainable Construction in Indonesia, in 2011 was not used anymore for planning the initiatives of each stakeholders in construction. Each stakeholder plans their agenda without any references and agreed targets.
2. The government, as a regulator, enabler, and facilitator, in Indonesia is not the Ministry of Public Works alone. Problems of coordination between ministries related to construction supply chains in Indonesia, as well as, related to sustainable development, existed and made a non-conducive atmosphere for the implementation.
3. 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.
4. Existed champions in sustainable construction are not adequately supported and promoted by government yet. Moreover, there is no incentives from the government for owners or developers to go green.

5. The readiness of construction supply chains to support the sustainable construction is still low. The supply chains include entities related to green materials, green suppliers, contractor's specialists, green equipment, and labors including the engineers and managers.
6. The value of green buildings is not recognized by owners and construction practitioners yet. It is commonly assumed that green designs will cost a lot more than non-green buildings.

3 Efforts Made According to the Conditions Surrounding Construction Industry

(1) Government Roles and Supports

In line with the concept of sustainable construction, the Indonesia government pledged to reduce greenhouse gas emissions 29% by 2020. The administration has argued that increasing number of green buildings, in Jakarta and other capital cities, is crucial to help the government reaching this goal. In 2010, the Ministry of Environmental has issued a decree No. 08/2010 regarding criteria and certification of the environmental friendly buildings. In this regulation, the environmental friendly buildings should meet certain criteria, such as: use local products with eco label; have a water conservation facility; have an energy conservation facility; do not use hazardous materials and cause Oxon depletion; have recycling facility for grey water; have recycling facility for waste; maintain indoor air quality; consider the sustainability site; and consider risk mitigation.

This decree mandated the building's owner to have a certification through assessment process conducting by an authorized institution. The authorized institution should apply to the ministry of environmental for the license. Therefore, the Indonesian government, represented by the Ministry of Environment, has issued a decree on criterion and requirements for an institution that could publish an assessment system for certifying green buildings in Indonesia.

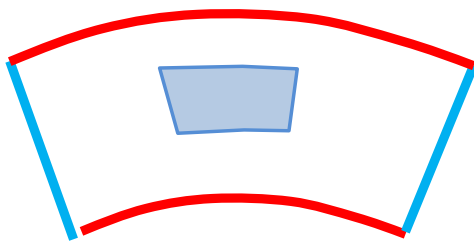
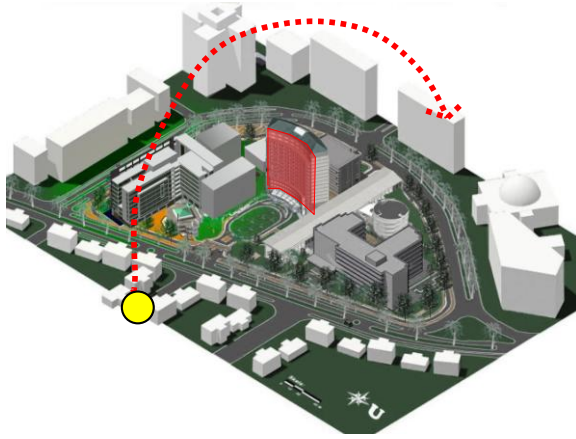
Moreover, the Ministry of Public Works has been developing a standard of green specifications and also rating tools for designing, constructing, and operating green governments' buildings that will be introduced to central and local governments. The green specifications will be a voluntary guideline, but a local government that is ready to implement it could make it a mandatory. Nowadays, there are two regulations in national level, decree of the Ministry of Public Works and Human Settlement No. 2/2015 about green building and decree of the Ministry of Public Works and Human Settlement No. 05/2015 about general guideline for implementing sustainable construction in infrastructure project delivery in the area of public works and human settlement – the ministry was merged from two ministries: Ministry of Public Works and the Ministry of Human Settlement in early 2015. Moreover, the Ministry of Public Works and Human Settlement has been developing rating tools for green buildings, green roads, green

construction, and sustainable infrastructure; a manual to green procurement using design-build delivery system; and a green construction supply chains strategy.

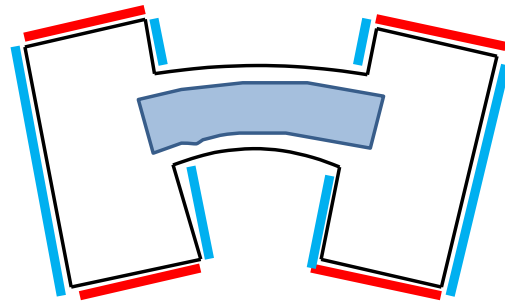
In 2012, in the city of Jakarta, as the capital city, green building certification is a mandatory for new as well as existing buildings based on the Governor Decree No. 38/2012. Even though the requirement to adopt green building concept in Jakarta is considered mandatory, it is a minimum level of green specifications that are achievable and processed as part of getting building permits for new buildings and operation permits for existing buildings. Even though, the implementation of green building regulation in Jakarta has not had a significant result yet, other cities will follow Jakarta. Recently, the city of Bandung just established a regulation of green building, and there are more cities will follow this policy such as city of Surabaya in East Java, and Makassar in South Sulawesi.

Many other efforts have been put by the government to support the implementation of sustainable construction such as:

- The Ministry of Environment and Forestry in collaboration with the International Finance Corporation (IFC), the Royal Melbourne Institute of Technology (RMIT) and some selected universities tried to develop higher education curriculum which incorporate the sustainability issues in it. This idea will give the opportunity to the university's students, in a very early stage of his/her professional carrier, to be exposed to information about sustainability concept, eco system and green movement campaign. The curriculum will integrate the principle of sustainable construction, sustainability parameters and scope of sustainable issues.
- Value of green building is campaigned continuously. The traditional buildings will produce 23% of greenhouse gas emissions, and by implementing green building concept, the building may save energy up to 43% and save water about 61% in dry season and 81% in rainy season (EECCHI, 2012).
- Green building for government offices. The Ministry of Public Works and Human Settlement built an eighteen-storey platinum green building based on Greenship rating tools of the GBCI. In its original design, the building faced East-West, which was not suitable for green building concept. It was then modified to North-South to provide a lower Overall Thermal Transfer Value (OTTV) from 76.8 W/m² to 28.1 W/m² and to give a lower thermal load for air conditioning system. By using light sensor, the energy consumption could drop from 167.62 kWh/m²/year to 95.19 kWh/m²/year. This building has received Asian award as the most efficient energy consumption building (EECCHI 2012).



Original building form



Modified building form

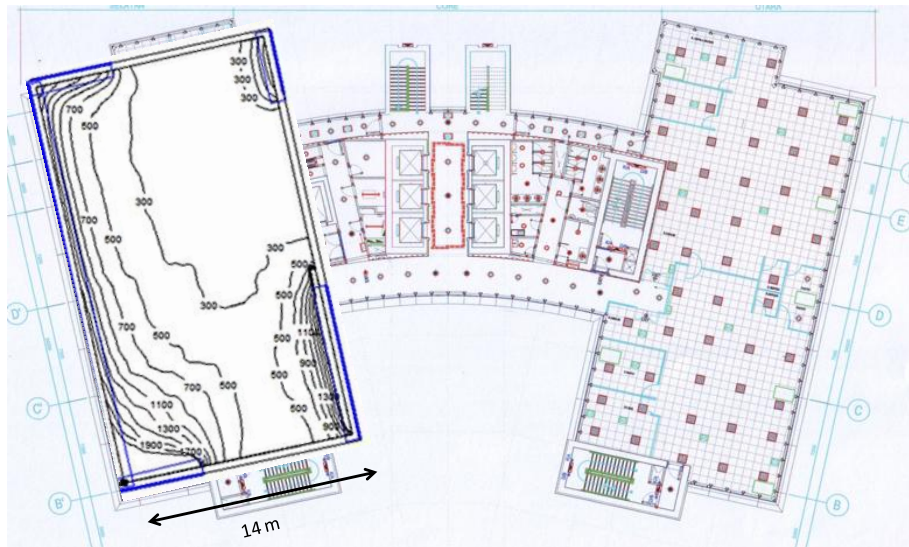


Figure 1: Design Consideration of the Ministry of Public Works and Human Settlement Green Building (EECCHI 2012)



Figure 2: The Ministry of Public Works and Human Settlement Green Building Complex (EECCHI 2012)

(2) Construction Supply Chains and Practitioners

Recently, there was a study conducted by the Ministry of Public Works that was aimed to measure the awareness 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. This finding is, of course, very encouraging for the implementation of sustainable construction in Indonesia, but it is also shown that only maximum 13% of the registered contractors in Indonesia that are ready, while the rest (87%) are small-size contractors and they would have lower level of awareness (Abduh et.al. 2012).

Some large contractors 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. Furthermore, what-so-called 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.

As suggested by Abduh (2014) some improvements are needed in order to mature the green construction supply chains that could support the green buildings in Indonesia:

1. Definition of green material should accommodate various form of construction material; bulk, manufacturer's products, fabricated material. This definition could be integrated with the development of eco-label for construction materials.
2. Emphasis on the use construction materials that are available locally. This would be enforced by the use of incentive for contractors that offer higher local contents in their technical proposal on the bidding.
3. Make the green building market more opened to more participants to participate throughout its supply chains. Demand information on the green building projects and materials needed should be accessible to more parties.
4. Green supply chains management practices should be demonstrated to develop more green sub-contractors and suppliers. Selection criteria for green sub-contractors and suppliers should be first addressed, and then the green capacity and knowledge development to the members of the approved supplier/sub-contractors list should be followed.
5. Competency and training program definitions for construction workers, in any level of management, to be able to conduct as required by green construction are needed. Certification could be one of the strategic ways to increase number of green personnel to support the green buildings.

As seen from the above list of improvements, most of them are returned to the government initiatives and role in promoting the green construction in Indonesia. Policies and regulations related to the above improvements are needed. The green contractors are also playing very important roles as champions in implementing green construction. Therefore, the green contractors should refine their practices in managing their supply chain toward green supply chains.

The GBCI, as an institution, will expand its activities by establishing branch offices in several big cities throughout Indonesia. The cities of Medan, Palembang, Semarang, Surabaya, Bali, Makassar, Manado, Banjarmasin and Balikpapan will be proposed as branch offices of GBCI. Moreover, regularly GBCI will offer workshops, trainings, and professional gathering, to widen the green horizon, e.g. Greenship associate training course, Greenship professional training course, COP workshop for energy conservation, renewable energy in relationship to zero net energy building, climate change that affects biodiversity, and attending international green building conference. In the near future, GBCI with the Ministry of Environmental & Forestry, Ministry of Public Work and Human Settlement, local government such as Jakarta, Bandung, Surabaya and Makassar, and the International Finance Corporation (IFC) are going to continue the green campaign, not only for buildings but also for neighborhood.

The International Finance Corporation (IFC) has introduced also what so called the EDGE, the Excellence in Design for Greater Efficiencies, which is considered as a simpler way to measure how green the buildings using only three important and significant criteria. It was launched globally in September 2014 and created initially for

banks in evaluating green building project. Since it is free, on-line and open for public, the system is used for owners or developers as design tools for green building. The criteria force a greenfield building to have 20% less energy, water and material consumption compared to an equivalent local benchmark. It is claimed to be suitable for an emerging green building market in developing countries like Indonesia since it can be used by building professionals without the need for expensive green building specialists (EDGE, 2016). The EDGE is still considered new for Indonesian construction practitioners and until now only one big developer, i.e., Ciputra Group, that used this system for its buildings. The GBCI also plays important roles in this EDGE system as a collaborator for the IFC in implementing the system, providing the green professional assessors and auditor accreditation, and for follow-up certification assessment needed in the future.

(3) Academia Research and Teachings

Other efforts 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 et.al., 2012, Abduh, 2014).

On the other hand, as previously stated, early in 2016, the IFC collaborating with the Royal Melbourne Institute of Technology (RMIT) held a workshop in Jakarta which was attended by some universities in Asian region, such as Sri Lanka, Thailand, Philippines, Singapore, China, and Indonesia to discuss about how to incorporate the sustainable issues into the higher education curriculum. It was observed that the issues of sustainability only introduced into curriculum as part of a course or as a special topic course. As an example in Indonesia, a special topic course with the topic of sustainable construction was offered once a year for Master's Program in Construction Engineering and Management, Civil Engineering Graduate Program, Faculty of Civil and Environmental Engineering, Institut Teknologi Bandung.

4 Future Development for Sustainable Construction Policy and Market

Based on the progresses of the implementation of sustainable construction in Indonesia as previously reported, it seems that the capacity buildings that have been done by all parties in construction industry have not moved the sustainable construction market

forward as expected. This market is still considered emerging and needs huge supports from all parties to participate in making the market mature. In the demand side, the government already put some regulations related to implementation of sustainable construction for general demands and green buildings for specific demands. Local governments already also put demands for green buildings in their jurisdictions. The systems for supporting the regulation have been issued and enacted. The GBCI has provided tools that can be used further for implementation, especially in green buildings. However, the slow progress of certification of 140 registered buildings indicated some problem that inherent in existing system and regulation or their implementations. The author argued that this is mainly due to immature and un-ready of construction supply chains to support the implementation or due to incomplete system or regulation. Moreover, low interest from the developers or owners to increase demand for sustainable construction is mainly due to misunderstanding about the value of green buildings, that green designs will cost a lot more than non-green buildings. In this case, the EDGE will help the penetration of green building's value understanding to common owners and developers before they are seriously eager to certify their buildings using the GBCI's Greenship.

Moreover, the government's never-ending role in implementation of sustainable construction in Indonesia is still significant. As mentioned before, the decree from the Ministry of Public Works and Human Settlement No. 5/2015 was a general guideline for implementing sustainable construction in infrastructure project delivery in the area of public works and human settlement. Even though the decree is for internal use of the ministry, it could be also a guideline for other construction stakeholders in general. For the ministry itself, this decree is very useful as an umbrella for other regulations to be developed related to technical terms of the implementation. For example, another regulation, which is No 2/2015 regarding green building, was also developed with the general guideline in mind. There are eleven sustainable principles that are to be considered in all phases of infrastructure project delivery that will be used as the common platform of the implementation.

One of the most important message from the decree No. 5/2015 is that there will be a commission that will guard the implementation of sustainable construction in the Ministry of Public Works and Human Settlement. This year is the deadline to set up the commission. This commission will monitor and govern the all implementation as well as the development of other needed regulations related to sustainable construction. Even though this commission is promising, there are some home works to be done before the implementation of sustainable construction could be effective. A roadmap of implementation until 2019 was already derived for all directorates and entities in the ministry to follow for the future development. Yet, the capacity building of all stakeholders of construction industry should always be in mind with strong support from the government.

5 Conclusion

In this paper, the recent development of sustainable construction initiatives from construction industry stakeholders were updated. The progress of sustainable construction initiatives and constraints faced by the stakeholders were also presented. Unfortunately, the development pace has been slower than it was expected, even though many key stakeholders have been playing their roles enthusiastically. The critical mass was not built yet in the Indonesian construction industry and its supply chains to support the development. Considering this situation, it is suggested that further development of the sustainable construction initiatives would be towards capacity building of the Indonesian construction supply chains. The need for engineers and managers for doing sustainable construction businesses is the most problematic one in Indonesia. Moreover, the specialist sub-contractors and suppliers, that are aware of and practicing sustainability principles in their businesses, are to be developed further to provide a competitive sustainable construction market. However, any implementation of sustainable construction in Indonesia still to be a led government activity that should be equipped with a more focused agenda of implementation.

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Sustainable Construction Policies and Market in Indonesia



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ASIA CONSTRUCT

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Outline

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8. Conclusion

Indonesian Construction Market (1)

3



- Two last years' GDP contribution of the Indonesian construction industry reaching more than 10%, and it is considered to be one of the largest in the world.
- Its GDP, around \$895 billion, is forecasted to grow by up to 10% per year in the next five to ten years, and the construction for sure will play a leading role in it. The Indonesia's government will spend about \$450 billion on infrastructure alone until 2020, with over \$22 billion of confirmed spending for 2016 (Trading Economics, 2016).
- It is forecasted that the Indonesian construction industry will grow 7.2% and 7.3% in 2016 and 2017 respectively, with the residential and non-residential construction to hold the strongest annual growth rates.

Indonesian Construction Market (2)

4



- The top-level consumers and upper classes are demanding high-quality finishing materials in larger quantities; greener, safer and more efficient materials.
- There is a million-unit house-building program enacted in the City of Jakarta and other urban areas.
- Infrastructure construction projects are already planned, such as: building bridges, ports, roads, railways and super express transits (over \$30 billion); fuel and chemical distributors for two new power plants; new National Health Insurance Program to build over 150 new hospitals; Global Smart City project costs \$15 billion; investment of over \$4 million in 10 to 12 new megastores; investing \$300 million for renewable energy sources, biomass, geothermal plants, and hydroelectricity plant (Konstruksi Indonesia, 2016).

Indonesian Sustainable Construction and Green Buildings Market (1)

5



- The prominent movement in sustainable construction in Indonesia is the establishment of Green Building Council Indonesia (GBCI) in 2009;
- As of 2015, there were 140 buildings in Indonesia registered to be assessed for green building certification. However, until July 2015, only 14 buildings have received the certification.
- The assessment process for certification was considered as a lengthy process; it takes about 6 to 12 months depending on the complexity of the building's design.
- Only few, about 20%, applicants are able to meet the requirements, e.g., legal documents, testing & commissioning certificates, documents' validation and verification, and on site observation.
- The need for experts, i.e., Green Professionals (GP) and Green Associates (GA), in helping the assessment process of the green building certification was also identified from the GBCI's side and also from the owner's and engineer's sides.
- Based on this progress, the green building certification in Indonesia is still lagged behind compared to other Asian countries.

Indonesian Sustainable Construction and Green Buildings Market (2)

6



- Even though, it has been four years since the Jakarta's Governor Decree No. 38/2012 about green buildings was issued, there were no more than 10 new buildings in Jakarta that could meet the requirements of this green building regulation.
- The developers of new buildings must comply with a maximum energy consumption of 45 watts per m², optimizing natural lighting, having a minimum indoor temperature of 25° C for minimizing air conditioning, and treating and re-using wastewater.
- Some developers of new buildings argued that the regulation is too strict in term of the limitation of total floor area to achieve an economic feasibility;
- Issues of the availability of assessors in responding the implementation of the decree is questionable.

Main Issues for Implementing Sustainable Construction

7



- There is no adequate master plan for the implementation.
- The government, as a regulator, enabler, and facilitator, in Indonesia is not the Ministry of Public Works alone..
- 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.
- Existed champions in sustainable construction are not adequately supported and promoted by government yet.
- The readiness of construction supply chains to support the sustainable construction is still low.
- The value of green buildings is not recognized by owners and construction practitioners yet.

Government Roles and Supports (1)

8



- Indonesia government pledged to reduce greenhouse gas emissions 29% by 2020.
- In 2010, the Ministry of Environmental has issued a decree No. 08/2010 regarding criteria and certification of the environmental friendly buildings. This decree mandated the building's owner to have a certification through assessment process conducting by an authorized institution. The authorized institution should apply to the ministry of environmental for the license.
- There are two regulations in national level:
 - Decree of the Ministry of Public Works and Human Settlement No. 2/2015 about green building
 - Decree of the Ministry of Public Works and Human Settlement No. 05/2015 about general guideline for implementing sustainable construction in infrastructure project delivery in the area of public works and human settlement
- The Ministry of Public Works and Human Settlement has been developing rating tools for green buildings, green roads, green construction, and sustainable infrastructure; a manual to green procurement using design-build delivery system; and a green construction supply chains strategy.

Government Roles and Supports (2)

9



- In 2012, 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 No. 38/2012.
- The implementation of green building regulation in Jakarta has not had a significant result yet, other cities will follow Jakarta. Recently, the city of Bandung just established a regulation of green building, and there are more cities will follow this policy such as city of Surabaya in East Java, and Makassar in South Sulawesi.

Government Roles and Supports (3)

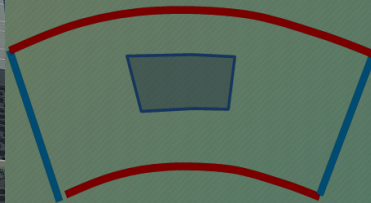
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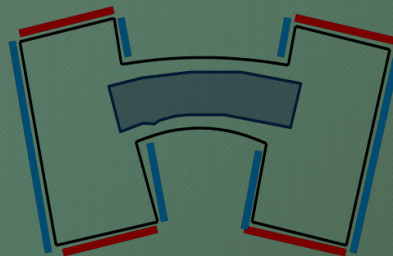
- The Ministry of Environment and Forestry in collaboration with the International Finance Corporation (IFC), the Royal Melbourne Institute of Technology (RMIT) and some selected universities tried to develop higher education curriculum which incorporate the sustainability issues in it.
- Value of green building is campaigned continuously. The traditional buildings will produce 23% of greenhouse gas emissions, and by implementing green building concept, the building may save energy up to 43% and save water about 61% in dry season and 81% in rainy season (EECCHI, 2012).
- The Ministry of Public Works and Human Settlement built an eighteen-storey platinum green building based on Greenship rating tools of the GBCI. This building has received Asian award as the most efficient energy consumption building (EECCHI 2012).

Government Roles and Supports (4)

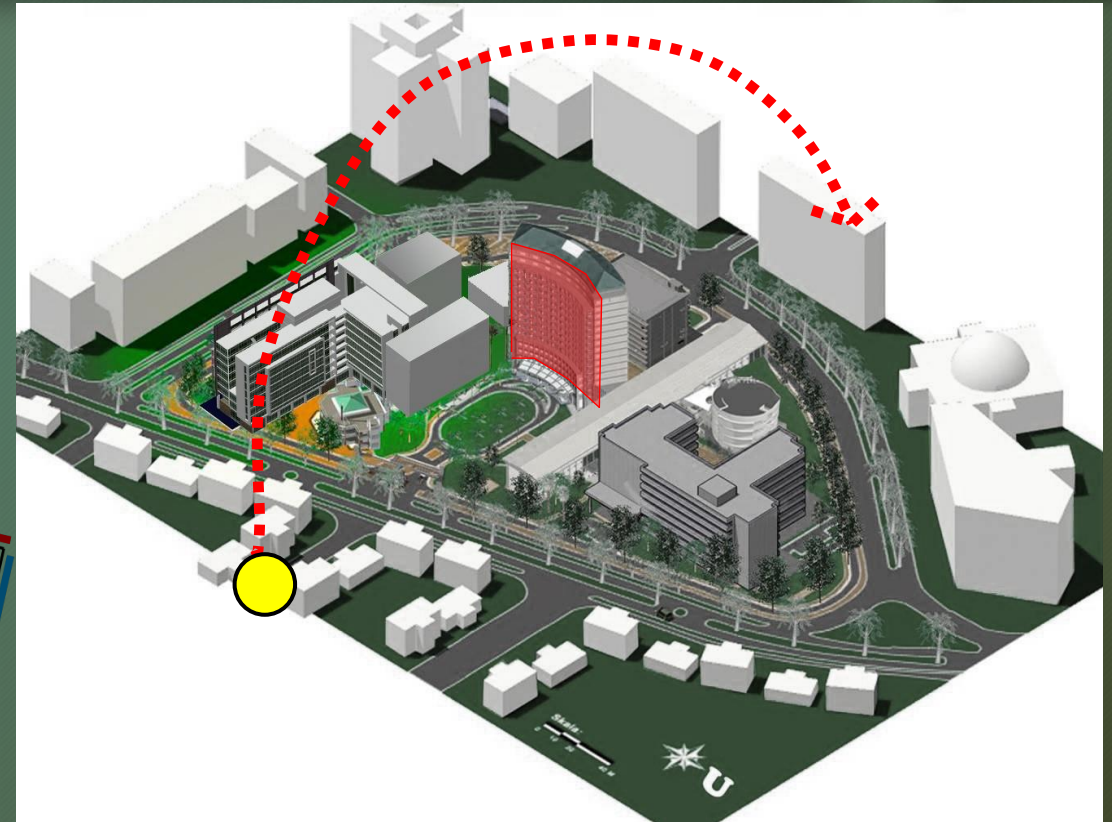
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Original building form

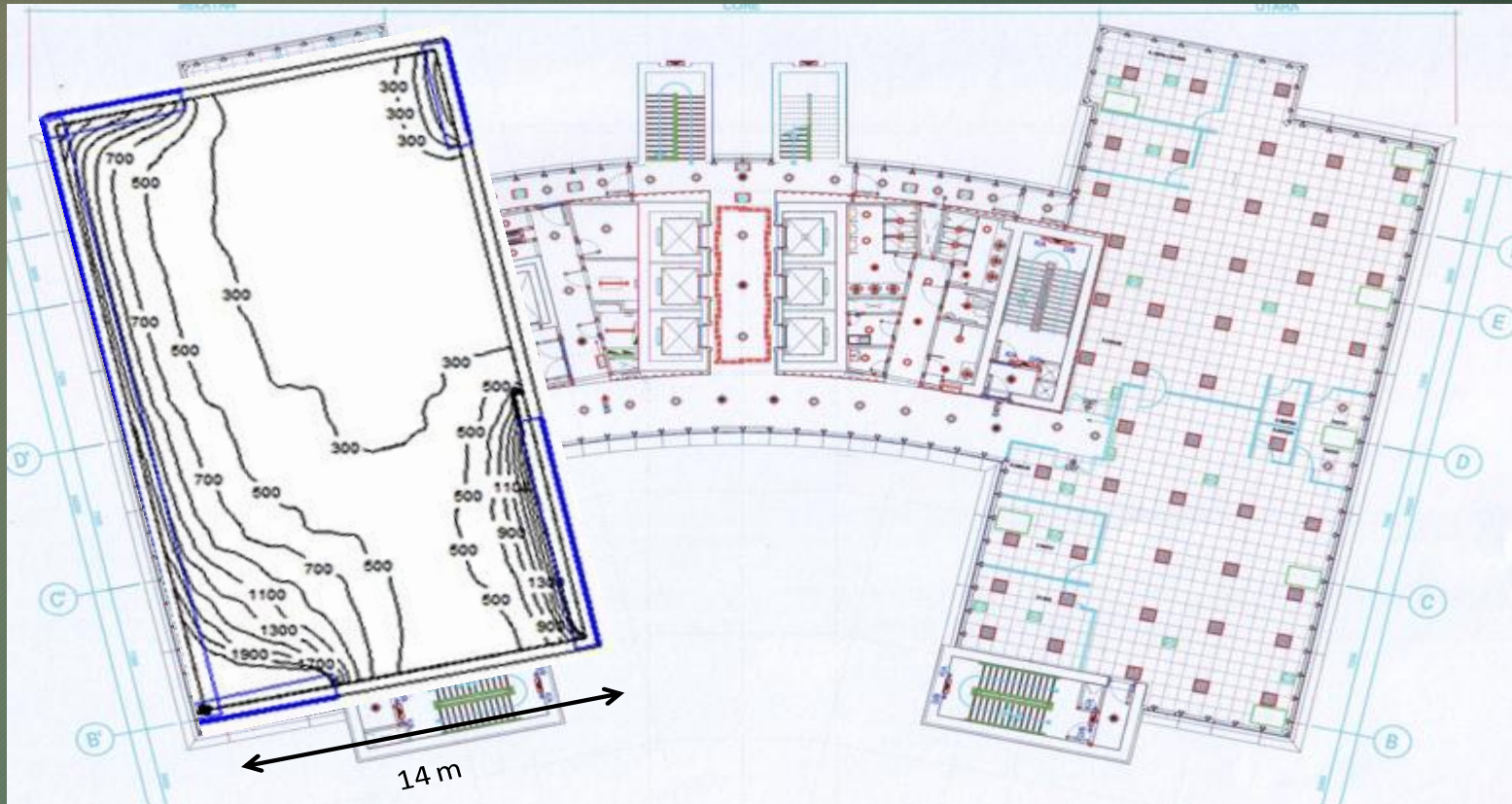


Modified building form



Government Roles and Supports (5)

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Construction Supply Chains and Practitioners (1)

13



Suggestions for green construction supply chains development:

- Definition of green material should accommodate various form of construction material; bulk, manufacturer's products, fabricated material.
- Emphasis on the use construction materials that are available locally.
- Make the green building market more opened to more participants to participate throughout its supply chains.
- Green supply chains management practices should be demonstrated to develop more green sub-contractors and suppliers.
- Competency and training program definitions for construction workers, in any level of management, to be able to conduct as required by green construction are needed.

Construction Supply Chains and Practitioners (2)

14



- The GBCI, as an institution, will expand its activities by establishing branch offices in several big cities throughout Indonesia. The cities of Medan, Palembang, Semarang, Surabaya, Bali, Makassar, Manado, Banjarmasin and Balikpapan will be proposed as branch offices of GBCI.
- The International Finance Corporation (IFC) has introduced also what so called the EDGE, the Excellence in Design for Greater Efficiencies, which is considered as a simpler way to measure how green the buildings using only three important and significant criteria. It was launched globally in September 2014 and created initially for banks in evaluating green building project.

Academia Research and Teachings

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- 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.
- Early in 2016, the IFC collaborating with the Royal Melbourne Institute of Technology (RMIT) held a workshop in Jakarta which was attended by some universities in Asian region, such as Sri Lanka, Thailand, Philippines, Singapore, China, and Indonesia to discuss about how to incorporate the sustainable issues into the higher education curriculum.
- A special topic course with the topic of sustainable construction was offered once a year for Master's Program in Construction Engineering and Management, Civil Engineering Graduate Program, Faculty of Civil and Environmental Engineering, Institut Teknologi Bandung.

Future Development

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- This market is still considered emerging and needs huge supports from all parties to participate in making the market mature.
- In the demand side, the government already put some regulations related to implementation of sustainable construction for general demands and green buildings for specific demands. Local governments already also put demands for green buildings in their jurisdictions.
- The GBCI has provided tools that can be used further for implementation, especially in green buildings. The EDGE will help the penetration of green building's value understanding to common owners and developers before they are seriously eager to certify their buildings using the GBCI's Greenship.
- The government's never-ending role in implementation of sustainable construction in Indonesia is still significant. One of the most important message from the decree No. 5/2015 is that there will be a commission that will guard the implementation of sustainable construction. A roadmap of implementation until 2019 was already derived for all directorates and entities in the ministry to follow for the future development.
- Yet, the capacity building of all stakeholders of construction industry should always be in mind with strong support from the government.

Conclusion

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- The development pace of the sustainable construction market has been slower than it was expected.
- The critical mass was not built yet in the Indonesian construction industry and its supply chains to support the development.
- It is suggested that further development of the sustainable construction initiatives would be towards capacity building of the Indonesian construction supply chains.
- The need for engineers and managers for doing sustainable construction businesses is the most problematic one in Indonesia.
- The specialist sub-contractors and suppliers, that are aware of and practicing sustainability principles in their businesses, are to be developed further to provide a competitive sustainable construction market.
- Any implementation of sustainable construction in Indonesia still to be a led government activity that should be equipped with a more focused agenda of implementation.

Thank You

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