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SB13 Manila

"SUSTAINABLE BUILDINGS, INFRASTRUCTURES AND COMMUNITIES IN EMERGING ECONOMIES"

25 - 27 November 2013
Richmonde Hotel, Eastwood City

Call for Participation

introduction

SB13 Manila is part of the SB2013-2014 worldwide series of conferences on Sustainable Buildings, with the international support and coordination by the four international founding co-sponsors, namely: International Council for Research and Innovation in Building and Construction (CIB); International Initiative for a Sustainable Built Environment (iiSBE); United Nations Environment Programme (UNEP) – Sustainable Building and Construction Initiative (SBCI); and FIDIC the global association of consulting engineering firms. SB13 Manila, Philippines will be held on 25-27 November 2013 in Metro Manila at the Richmonde Hotel, Eastwood City.

about the conference

This scientific, technological and professional gathering aims to convene leaders, experts, practitioners, educators, researchers, and learners to share and review current and developing issues as well as acquire new and innovative strategies and initiatives concerning sustainable buildings, infrastructures and communities in emerging economies. Specifically, the conference aims to: (a) address issues that may arise from the tension between sustainability vis-à-vis the priorities and needs of an emerging economy; (b) learn about the latest in building technology; and (c) find out how the building and construction industry can effectively adapt to the requirements of a growing economy.

Take part in the fusion of ideas and transform the traditional construction industry into a vibrant, futuristic and ecologically-sound sector ready to meet the increasing challenges of the environment brought about by rapid economic growth. Find out where the future of buildings and infrastructure is headed in this meeting of minds -- from policy- makers to leading-edge technology developers. Learn from the wealth of experience, knowledge and developments that will unfold. Or simply just meet and connect with people in the industry for the sake of our future--our sustainable future.

key dates

ACTIVITIES	DATE
Notification of Full Paper Acceptance	August 15, 2013
Deadline for Early Registration	September 30, 2013
Announcement of Final Program	October 25, 2013
SB13 Manila Conference	November 25- 27, 2013

key topics

The SB13 Manila Conference will feature the following key topics:

+ Sustainable buildings
+ Sustainable infrastructures
+ Sustainable communities
+ Energy efficiency and new sources of energy
+ Water efficiency and management
+ Materials and resources
+ Disaster risk management and business continuity planning
+ Governance and regulation

about the venue

The venue of the conference has been selected to best suit the requirements of the conference and the convenience of the participants. Located in a recent urban development in Quezon City, Metro Manila, Richmonde Hotel Eastwood City is easily accessible via C.P. Garcia, Ortigas Avenue, and other major thoroughfares. Situated along the C-5 highway, it is connected almost directly to the Ninoy Aquino International Airport. It is conveniently adjacent to business, shopping, recreation and entertainment establishments that cater to all the needs of participants. The area itself presents a good case study of recent initiatives and attempts in sustainable urban development.

EASTWOOD RICHMONDE HOTEL
17 Orchard Road, Eastwood City, Bagumbayan
Quezon City 1110 Philippines

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call for participants

Participants are welcome to discuss papers on any topic within the conference scope for oral or poster presentation.

Oral presentations will be allotted a 20-minute period, while poster presentations will be exhibited for at least one day.

The submitted abstracts have been raeviewed by the scientific committee. Presenting authors must be officially registered not later than September 30, 2013. Non- registration of presenting author, would mean non-inclusion of the paper in the Programme and Book of Abstracts.

Participants may take advantage of early registration fees until 30 September 2013.

registration fees

	Early Registration	On-site Registration
Local participants		
2-day conference	PhP 6,750.00	PhP 7,500.00
2-day conference with Master Class	PhP 9, 250.00	-
Master Class only	PhP 3, 000.00	-
Foreign participants	USD 350.00	USD 400.00
Undergraduate students (snacks only)		PhP 1,500.00
Daily Registration		
Professional		PhP 3,750.00
Student (snacks only)		PhP 750.00

The fee entitles the participants to attendance at all scientific sessions, refreshments and lunch during the conference unless specified otherwise. Each registered participant will receive a set of conference materials including the souvenir programme and a CD containing the abstracts of the papers to be presented. Master Class registration is separate and limited in number.

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programme at a glance

DATE	25 November	26 November	
AM		PARALLEL SESSIONS	
	Registration @ 8am OPENING CEREMONIS followed by Hon. Rogelio Singson	BUILDING STREAM Registration @ 8am Keynote Speaker: Dr. Nirmal Kishnani Rene Luis Mata Sustainability in Heritage Conservation Luis Ma. Boot and H.V. Lee Jr. An FEM Simulation of the Cochlea I. Establishing Comfort and Illustrating Injury Miguel Guerrero Rated PG: Practical Green Antonin Lupisek1* amd Petr Hajek2 Localization of Sustainability Assessments of Buildings Ruel Ramirez Structural Assessment of the Malate Catholic Church	INFRASTRUCTURE STREAM Registration @ 8am Keynote Speaker: Dr. Pekka Huovila Andrea Fitriano Community Footbridge: Building Resilience with Bamboo Kent Renier Carandang Laboratory and Field Investigation of Gabion-type Low Dam with Vermicast as Core Material Fernando Mersa Putra, Sandra Cabane, Mark Albert Zarco Modified DOST-KASC Method: A Simple, Rapid, Cost-effective and Semi-empirical Landslide Assessment Tool Francis Jerome de Lara*1, April Eunice Esmilla1 and Christian Orozco1 Evaluation of Strength and Infiltration Injury Candelaria, Tanchuling, Kasilag and Carrascal Using Cocomats for Erosion Control
PM			
	Keynote Speaker: Dr. Greg Foliente Urban Sustainability Transitions and Number Six Dr. Ma. Joycelyn Mananghaya Safeguarding Ifugao Traditional Settlements Dr. Eric Cruz and Dr. Eric Santos Mangrove Replanting - Towards a Sustainable Community- engaged Coastal Protection Program in the Philippines Arch. Paulo Alcazaren Urban Planning and Parks for All Hontiveros, Marquez and Tanchuling Characterization and manufacture of bricks from plastic wastes	Christian Sese Computerized Assessment Tool for Hospitals Safe from Disasters Harvey Bisa Empirical Threshold Values of Roof Connections using Pull-out Test on Nails and Screws Liezl Tan and Jaime Hernandez Development of a Rapid Condition Assessment Tool for Reinforced Concrete Moment Resisting Frame Buildings in the Philippines: Structural Component Nikkei Pfeiffer Tadili Preliminary Test of an Innovative Seismic Retrofit Scheme for Wall-type Residential Buildings using Impact loading Lestelle Torio Development of a Rapid Condition Assessment Tool for Reinforced Concrete Moment-Resisting Frame Buildings in the Philippines: Geotechnical Component Albino Aguilar III*1, Nathaniel B. Dela1 and Christian Orozco Study on the Relative Importance of Green Building Attributes in Philippine Urban Setting using Analytical Hierarchy Process Diocel Harold M. Aquino*1 and Christian Orozco1 Study on the Relative Importance of Green Building Attributes in Philippine Urban Setting using Analytical Hierarchy Process Christian Orozco Development of a Rapid Condition Assessment Tool for Reinforced Concrete Moment-Resisting Frame Buildings in the Philippines: Material Component	Dr. Eric Cruz Towards Sustainable Development of Storm-Damaged Coasts - Engineering Design Methodology for Low Environment Impact Infrastructure for Coastal Tourism Dr. Boris Welkachew Toward Sustainability and Resilience, facing Major Risks, Through Professional Training Means Developments in SE Asia Crescencio Montalbo, Jr. Sustainable Public Transport - Is the Philippines Ready? Dr. Lucia Frattari Innovation, Simulation, Optimization Albino Aguilar III*1, Nathaniel Dela1 and Christian Orozco Environmental Performance Assessment of Residential Green Technologies Using Philippine Green Building Rating Systems

NOVEMBER 27 - Master Class (Separate Registration)

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Manila Conference:

"Sustainable Buildings, Infrastructures and Communities in Emerging Economies"

Book of Abstracts

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Holistic Approach for Green Construction in Indonesia

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Green construction terminology has been introduced to the Indonesian construction industry in the last 5 years; as soon as the demand for green buildings emerged. The Indonesian government has been preparing some needed regulations related to the implementation of green construction recently. Other related regulations have been sanctioned regarding green specification and certification, especially in buildings. Moreover, some big construction companies have declared themselves as green contractors that practiced green construction applications in delivering green buildings. However, recent studies on the effectiveness of the implementations have shown the need of more holistic approach in delivering the green construction. The green contractorsin Indonesia have already tried to practice what so called green behavior and practices in construction. Yet, the delivery of construction has not been satisfactory to meet all green specifications with some notable weaknesses in producing the construction products efficiently and effectively due to lack of lean construction techniques and green supply chains. Nevertheless, without the availability of the construction supply chains in supporting the lean construction approach, the green value would not be delivered at all. This paper discusses the need of holistic approach in delivering green construction by contractors. The approach would cover three important components of green construction, i.e., green behavior and practices; green construction processes; and green supply chains. The recent development of each green construction component in Indonesia is discussed as well.

Keywords: green building, green construction, green supply chains, sustainable construction

Carrot, Stick and Tambourine: A Comprehensive Approach to Green Building Policy

Hans Shrader

About 50% of global construction spending is expected to happen in Asia by 2020. However, much of this region does not have a robust system in place to mandate and regulate the environmental and economic impact of building construction and operation. Although the region has a strong building design vocabulary that is very responsive to the unique climatic and social needs, a significant portion of the new construction borrows its design vocabulary from America and Europe. This results in inefficiency of construction materials, water and energy.

A locally developed green building policy, informed by global best practices, incorporating "carrots" (incentives, rebates, fiscal instruments, etc.), "sticks" (regulations and legal mandatory requirements) and "tambourines" (awareness and education) is essential for maintaining environmental and economic sustainability.

Construction is one of the key drivers of the economy in most developing countries. Construction policy makers in developing countries have to strike a delicate balance between promoting continuous, unhindered economic growth and regulating the growth to sustainable levels that doesn't accelerate climate change, environmental pollution and energy shortage. A successful green policy should consider the multiple options available and choose a combination that is quick and impactful, yet simple and inexpensive.

IFC is developing Green Building market transformation policies in partnership with government and private sector in many developing countries using a combination of mandatory regulations, awareness, capacity building, direct green building investments and development of fiscal instruments such as green mortgages/ construction loans and the low-cost building resource efficiency rating tool, EDGE (Excellence in Design for Greater Efficiency).

HOLISTIC APPROACH FOR GREEN CONSTRUCTION IN INDONESIA

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Abstract: Green construction terminology has been introduced to the Indonesian construction industry in the last 5 years; as soon as the demand for green buildings emerged. The Indonesian government has been preparing some needed regulations related to the implementation of green construction recently. Other related regulations have been sanctioned regarding green specification and certification, especially in buildings. Moreover, some big construction companies have declared themselves as green contractors that practiced green construction applications in delivering green buildings. However, recent studies on the effectiveness of the implementations have shown the need of more holistic approach in delivering the green construction. The green contractors in Indonesia have already tried to practice what so called green behavior and practices in construction. Yet, the delivery of construction has not been satisfactory to meet all green specifications with some notable weaknesses in producing the construction products efficiently and effectively due to lack of lean construction techniques and green supply chains. Nevertheless, without the availability of the construction supply chains in supporting the lean construction approach, the green value would not be delivered at all. This paper discusses the need of holistic approach in delivering green construction by contractors. The approach would cover three important components of green construction, i.e., green behavior and practices; green construction processes; and green supply chains. The recent developments of green construction in Indonesia are discussed as well.

Key words: green building, green construction, green supply chains, sustainable construction

1 BACKGROUND

Construction industry is considered as 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. The construction industry contributes to the wealth of a nation; in Indonesia, construction sector contributes about 6.5% of the GDP and around 6% of national labors depend on this sector (Statistics Indonesia, 2013). However, the construction process and the related activities consume the most natural resources and generate significant wastes.

Construction practices with better planning could 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 (Abduh et. al., 2012).

The terms green, high performance, and sustainable construction, are often used interchangeably. All these terms address the economic, ecological, and social issues of a building in the context of its community. The terminology defined by CIB is widely used. The seven principles of sustainable construction should apply when evaluating the components and other resources needed for construction. The Principles of Sustainable Construction are relevant across the entire life cycle of construction, from planning to disposal, which referred to as deconstruction rather than demolition. When considering the resources needed to create and operate the built environment during its entire life cycle: land, materials, water, energy, and ecosystems; the seven principles should be the valid basis (Kibert, 2008).

To apply the seven principles of sustainable construction requires a design/construction process that is resource-conscious. In selecting construction materials for example, a closed loop means a process of keeping materials in productive use by reuse and recycling rather than disposing of them as waste at the end of the product or building life-cycle. Engineers need to plan involving products that is easily disassembled, and the constituent materials are capable and worthy of recycling. In many cases, construction materials are not completely recyclable, and then they can be down cycled for lower-value reuse.

While the principles of sustainable construction are also applicable to the construction industry in a developing nation, sustainable construction is approached in various ways with different priorities in different countries. The main emphasis in

developed countries has been on ecological impact on the environment (natural resources) or green. However in countries like Indonesia, the concerns of sustainability are more holistic, including the economic and social issues (Wirahadikusumah and Abduh, 2010).

2 SUSTAINABLE CONSTRUCTION IN INDONESIA

A formal initiative to implement the sustainable construction in Indonesia has been started by the Ministry of Public Works in 2009. 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 (Abduh and Wirahadikusumah, 2012).

Based on those challenges the Indonesian construction industry faced, it was suggested the implementation should focus on the following issues (Abduh et. al., 2012):

1. Moving from the already government-adopted weak sustainability approach to more integrated strong sustainability approach. It means that the approach should be more holistic.
2. Improving public awareness in sustainable construction to be the primary driver that could answer other challenges in sustainable construction easier. It means that implementing sustainable construction cannot be done by one party only; all parties related to the construction should contribute.
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. Technologies should be the drivers to the approaches of implementing the sustainable construction.

The Ministry of Public Works had been launched what it is called a draft of Agenda 21 for Sustainable Construction in Indonesia; please see Figure 1 (Goeritno, 2011). This draft agenda was a result of the two-year study conducted by the Ministry and several focused group 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.

Technology enablers are required since development is supported by technology. The socio-economic goals of development cannot be met without the use of technology. However, the technology used must also support the environmental and socio-economic principles of sustainable development. Technology enablers can be divided into “hardware", "software" and know-how. For technology enablers to be successful, processes for technology transfer and management are required, as well as access to those technologies. This requires the presence of functioning institution enablers. Furthermore, specific value system enablers are necessary to bring about the successful uptake of technologies that are conducive to sustainable development. The enablers are interdependent and multi-dimensional.

Figure 1 Indonesian Sustainable Construction Agenda (Goeritno, 2011)

Developing the necessary enablers requires an approach that operates simultaneously at various scales, as well as different time horizons. There are enablers that have to be immediately developed to provide a sound basis from which to work. Concurrently

with these immediate enablers a set of medium term and long-term enablers also have to be developed. The immediate enablers relate to the creation of an enabling environment and the collection and sharing of information for benchmarking and assessment. The medium term enablers relate to the mitigation of impact and actual implementation of sustainable construction, while the long-term enablers relate to the creation of a totally new and more sustainable built environment paradigm.

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.

3 RECENT DEVELOPMENTS OF GREEN CONSTRUCTION IN INDONESIA

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.

In addition, du Plessis (2003) pointed out that construction companies had to change or even remove current practices that were considered as standard practices in construction in order to implement the sustainable construction principles successfully. There should be a technology leap in construction, reinventing the construction industry, and rethinking of construction products. According to that statement, the constructors play very important roles since most of the transformation will also be happened in the field of construction projects. Moreover, Glavinich (2008) mentioned that one of the most important aspects in delivering sustainable infrastructures is whether the constructors build the infrastructures in a sustainable way. Yet, the performance of the constructors depend mostly to the performance its supply chains (suppliers and sub-contractors). Then, the concept of green construction was introduced to the construction practice as a green way to perform construction in the field by the contractors. The concept is considered as an emerging terminology for contractors that still opens many interpretations, but, on the other hand, also invites innovations. Recent innovative approaches implemented by several contractors represented the easy and more doable approaches taken by the contractors in responding the green construction concept.

3.1 Green Buildings

One of other prominent movements in green 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, 3 new green building projects and 3 existing building that had received platinum level of certification, and there are more than 19 green building projects that were registered to be assessed the designs. 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 (Abduh et. al., 2012). The rating categories of Greenship for new buildings are:

1. Appropriate site development;
2. Energy efficiency and conservation;
3. Water conservation;
4. Material resources and cycle;
5. Indoor air health and comfort; and
6. Building and environment management.

3.2 Green Contractors

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 labors, 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 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 (Wirahadikusumah and Ario, 2012). However, there are big differences in score of awareness for contractors that are located in Java Island and the ones that are not. The large and medium contractors located in Java are more aware since the demand to implement the sustainable construction is higher from the owner of the projects. 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.

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 of 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; and
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.

3.3 Government Initiatives

The Indonesian 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. 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.

Moreover, the Ministry of Public Works has been developing the followings:

1. A manual to deliver green projects;
2. A rating tools for green construction;
3. A manual to green procurement using design-build delivery system;
4. A standard for green roads; and
5. A green construction supply chains strategy.

In fact, starting year 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 a 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.

3.4 Green Construction Materials

Based on Ahn and Pearce (2007), the construction companies believed that the initial cost premium is very high compared to conventional construction, this is due to the cost of material needed in the specifications. In the future, green construction has to be a common practice; therefore, there is a need for material manufacturers to minimize the cost of green building materials. In Indonesia, the green materials are considered always more expensive. There is a list of what-so-called green materials, which most of them are related to green building materials for architecture purposes, that belongs to the foreigner manufacturers or importers. Indonesia practitioners should change their mind-set not to use imported green materials, since the cost and carbon emission generated from them are higher compared to the local construction materials. To support this, a rating tools related to green building and green construction is still needed.

Moreover, many techniques are available to fulfill sustainability requirements in the design and construction of building

structures. One of them is by adopting durable materials for the structures. Durable materials will produce long lasted building structures, and therefore, will reduce the need for extra consumption of natural resources required to replace the structures if they last prematurely. However, construction industries in Indonesia have not considered the use of durable materials as the most important criteria for civil constructions. As a result, many existing constructions, especially in marine environment, were in fact built using low grade, low durability concrete. General characteristics of concrete construction activities are usually involving excessive consumption of natural resources (stone, sand, and water) and discharging large volumes of construction wastes. In addition, production of cement itself is known to contribute as much as 7% of the total CO2 emission to the atmosphere. Every single ton of cement clinker production will result in 1 ton of CO2 emission. In the long run, the construction activities will certainly deteriorate the environment.

Regarding eco-labeling, there had been an initiative from the government to develop the Indonesian eco-label for several manufactured products. Yet, until now the development is far from satisfaction. Only few construction-related products that have eco-label; most of them are related to architectural interior finishes products and gotten their certificates from overseas. There is no third party institution that could give certification of eco-label in Indonesia yet. The self-declaration is the mode of eco-labeling that could be used by the manufacturers or producers that are considered aware and produced environmental friendlier products. Recently, there is a demand from the Ministry of Environment to re-consolidate the initiatives of eco-labeling and be implemented more widely by all interested parties in Indonesia, including construction industry. The most important to be set first is the definition of green materials or services in construction industry.

3.5 Research and Developments

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, geo-polymer concrete, alkali activated material, recycle aggregate concrete, and pervious concrete have been very exciting fields of research areas recently.

As in many other parts of the world, considerable research directed towards finding ways to increase the durability of concrete materials and structures, has been conducted in Indonesia. One of the objectives of the research is to develop high performance construction materials, in particular high performance concrete, with enhanced durability and service life and an excellent resistance to corrosion and chemicals. The particular research and development of high performance concrete has been underway in many places in Indonesia since more than 10 year ago, using supplementary cementing materials locally available in those places. The researches have encompassed all aspects of design, construction and technology. These research activities are essential to improve the knowledge on the durable construction materials. In addition, the research outcome can be adopted to improve the current building code on durability and support the development of design and construction standard for durability.

The research on the use of waste materials, such as fly ash, has triggered the use of the material in many concrete constructions in Indonesia. Currently, most ready mix concrete producers utilize fly ash in their concrete products. Besides reducing the concrete production cost, the use of this material can result in more durable concrete and more environmentally friendly concrete materials. Nowadays, in USA, concrete material with 50% fly ash content (High-Volume Fly Ash (HVFA) concrete), has been frequently used. As the fly ash content is quite high, HVFA concrete is also named as green concrete.

Alkali Activated Material (AAM) has become the most promising material to substitute OPC/Ordinary Portland Cement based materials because of its strength, durability and environmental aspects. AAM has mechanical characteristics that can be compared to OPC based materials in every phase i.e., paste, mortar and concrete. Alkali Activated Material (AAM) is a solid material formed by alkali activation on the silica and alumina-rich materials. Therefore, the AAM basically does not need Ordinary Portland Cement/OPC as the binder. Indonesia has a plenty of sources of silica and alumina rich materials. The sources of materials can be from i) natural resources, such as volcanic ash, certain types of mud, and kaolin, or ii) industrial wastes such as fly ash, slag, silica fume, rice husk ash etc. Many researches are going on right now in Indonesia to develop AAM by utilizing various sources of silica and alumina rich materials available locally in Indonesia. One of which was performed by Simatupang et.al, (2013), in investigating the Alkali Activated Fly Ash Material (AAFAM) for substituting OPC/Ordinary Portland Cement based materials. AAFAM has mechanical characteristics that can be compared to OPC based materials in every phase i.e. paste, mortar and concrete.

On the other hand, researches in the management area of green construction are emerging (Wirahadikusumah and Abduh, 2010), Ervianto et al. 2011a, 2011b). In the last 3 years, the researches related to green construction, carbon foot-print calculation for construction projects, optimization of construction processes for reduction of CO2 emission, and green construction supply chains have been developed and become several research agendas of green construction in Indonesia.

4 PROBLEMS IDENTIFIED

Besides enthusiasm from seeing the recent developments of Indonesia in implementing green 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. 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.

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., 2011a). 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 (2012a) 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.

5 HOLISTIC APPROACH TO GREEN CONSTRUCTION

The previously identified problems faced by Indonesian construction practitioners in implementing green construction showed an improvement opportunity. Recalling what du Plessis (2003) emphasized in setting strategies in implementing sustainable construction and also the Indonesian agenda of sustainable construction, the approach to the green construction should be more holistic compared to the existing. In this line, the government's role is important as the regulator, facilitator, and enabler.

As mentioned before, the goals of the sustainable construction in Indonesia, and many other developing countries, are to achieve three enablers: value system, technology, and institution. Abduh and Fauzi (2012b) introduced three important aspects or components of green construction to be implemented: Green Behavior and Practices; Green Construction Process; and Green Supply Chains. Those components are actually correspondent with three enablers of sustainable construction, but with terminologies that are easier to be comprehended by construction practitioners (Figure 2).

In principle, implementation of green construction should begin with the individual behavior and contractor organization practices or called Green Behavior and Practices. 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. To fulfill this green construction component, the contractor should have the value system of green adopted and sanctioned. This component could measure how well the contractor personnel behave in a green way and how well the contractor organization introduce the green practices policy and also make them as a standard operating procedure.

Other important component 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 component is called as Green Construction Processes. However, this component is also known as lean construction principle. This component could 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. In this component, waste could be physical or non-physical.

Figure 2 Components of Green Construction

The last but not the least, there is another component that is very important to support two previous components of green construction, it is called Green Supply Chains. Since most of the production factors of a construction project are related to the availability of materials or commodities (about 70% of construction cost), the management of construction supply chains is very important. As stated by Glavinich (2008), the performance of the construction depends mostly on the performance of its supply chain; therefore, the green construction supply chains management is very important aspect to be considered in green 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.

6 CONCLUSIONS

This paper discussed the recent developments of green construction concept in Indonesia. The concept is considered as an emerging terminology for contractors that still opens various interpretations, but, on the other hand, also invites innovations. Recent innovative approaches implemented by several contractors represented the easy and more doable approaches taken by the contractors in responding the green construction concept. Based on the evaluation of current practices and products related to green construction, it was concluded that most of the contractors have already practiced only one component of green construction, i.e., green behavior and practices. This is not adequate since there are two other important components to be implemented in order to fully realize the green construction concept, i.e., green construction process and green supply chains.

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 components of green construction, i.e., green behavior and practices, green construction processes, and green supply chains, should be addressed adequately in order to implement green construction holistically.

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