

# Towards Indonesia Sustainable Future through Sustainable Building and Construction

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## Abstract

Today's world is plagued by numerous buildings, hastily erected with little concern about how they will affect the environments into which they are introduced. The motivating factors for their constructions are allegedly speed, economics and efficiency. However after years of accepting this misguided methodology critics are beginning to surface, recommending a better path toward the future and dispelling the myths that surround their alternative, Sustainable Building and Construction.

Sustainable Building and Construction cannot be separated from Sustainable Development, as a concept, sustainable development covers almost all aspects of life, ranging from political policy, government, business strategy to lifestyle. Not only the beginning, but also the process and outcome. Therefore, the realization of sustainable development is complex and must implement interdisciplinary systems.

For *Green Building Council Indonesia (GBCI)*, Sustainable Building is just not a style and spirit; rather it is a new consideration in which we think about design, building construction and how we operate buildings. With our upcoming rating system "GREENSHIP", sustainable design is our works by considering local heritage approaches while integrating them with new technological advances as resources of performance based to provide a quick overall assessment of performance on most critical parameters in building and enable comprehensive organization to report on its overall environmental improvement. Together with *Green Policies* as a written statement that clearly indicates the position and values of the organization on environmental and sustainability issues, reduce the life cycle and operating cost as the prime business reason for developing green building. In fact most of local architect cannot stop from creating the more likely-green buildings in Indonesia from ten years ago even haven't yet any official rating system. At least 20 public building per year have been designed regarding this green and sustainable issue and needless to say, as modern and as tropical it could be.

The purpose of this paper is to inform the reader on the many far reaching benefits that Sustainable Design has to offer, especially toward Indonesia sustainable future.

**Keywords:** Sustainable Building & Construction, Performance-Based, Green Policies, Best Practices, Developing Countries

## Introduction:

### Why Are We Becoming Green?

Green is at the moment a popular term in our daily life; most of companies and businesses claimed that they are in "*green communities*", by merely applying certain feature in their properties. A lot of new property development claim that their development is "*green*". Green is

becoming a new trend nowadays. Some Indonesian architects and engineers have been designing and applying the green principles in the design and achieve what supposed to be a green building standard. It is not merely a trend, it has to be a lifestyle change, the demand of the consumer of a “green” living environment meets the planet current conditions, climate change and degrading environmental conditions. It is important that Indonesia starting to establish a Green Building Council. “Green” has become the shorthand term for the concept of sustainable development as applied to the building industry. Green buildings, also known as high-performance buildings, are intended to be environmentally responsible, economically profitable, and healthy places to live and work.

The environmental impact of the building design, construction and operation industry is significant. Buildings annually consume significant amount of energy, electricity, water and produce waste. Development shifts land usage away from natural, biologically-diverse habitats to hard-space that is impervious and devoid of biodiversity. The far reaching influence of the built environment necessitates the action to reduce its impact. Green building practice can significantly reduce or eliminate negative environmental impacts and improve existing unsustainable design, construction and operation practices. As an added benefit, green design measures reduce operating cost, enhance building marketability, increase worker productivity, and reduce potential liability from indoor air quality problems. In other words, green design has environmental, economic and social elements that benefit all building stakeholders, including owners, owners, occupant and general public.

### **Green Building Council Indonesia; Promoting Sustainable Building Concept in The Archipelago**

In Indonesia, the national development performance targets for Sustainable Buildings developed by Green Building Council Indonesia (GBCI), a non-for-profit organization with a mission to support, promote and maintain the goal of market transformation, changing industry and public behavior, creating a forum and dialogue, build community and expertise in building and environmentally friendly construction. They legally authorized and cooperated with the Ministry of Environments (KLH) which do the research activities with all aspect of management of natural resources, conduct the environmental impact assessment, environmental management and laws, conservation of coastal beaches and waters, control pollution, waste treatment technology, environmental health and another. For supporting the targets, recently they authorized the criteria and green building certification. The government should encourage and facilitate initiative of the stakeholders in implementing mitigation and adaptation climate change through the management-friendly building environment. The perceived barriers of this government agency is still biased in laws and regulations which are made of green building regulations to serve as guidelines in building the future, because the legislation base of less powerful in determining the domain of green building terms. Their understanding was often separated from “Green Building” in its implementation, while another one has a close relationship to answer the challenges faced. On the other hand, in recent years the Ministry of Environment (KLH) seeks to promote Sustainable City as a place of establishment of Sustainable Building, through “**Program Bangun Praja**” which aims to improve performance in environmental management, and better encourage other regions outside the capital to join apply with fixed focus in creating Sustainable City in its infancy, covering up the management of the building footing and green open space (including shade), the management of public facilities, pollution control and waste water.

The second government agency involved to determine the performance target was The Ministry of Public Works (PU) as government-related elements that always made resources, such as

from Directorate of Technical Planning and Settlement Development, Directorate General **“Cipta Karya”** and Directorate Development and Restructuring Settlements. The Ministry of Public Works commits to support the issues which will build their new Directorate General of Water Resources (SDA)’s building in their complex. The 8<sup>th</sup> (eight) floor of the building is targeted to be completed by the end of 2010. This building will use the concept of Green Building energy efficient. Architecture of this building will be getting tropical-style lighting and natural ventilation very possible without the Air Conditioner. This building will also use the recycle water where there will be many pond or rain water capacities even in the 3rd floor which created the park in addition to socialization, to relax but also serves to bin water. In general, the interior is made from recycle materials that reflect sustainable architecture. The Minister hoped that this building can be a **“Pilot-Project”** building in terms of energy, simplicity, effectiveness and flexibility, even for people who have physical disorders such as blind people. In terms of energy saving and office-room sharing must follow the requirements of new and in accordance with the new rules. According to **Mr. Achmad Noerzaman** Director from **PT. Arkonin**, the architecture consultant said the modern building is based on the principles of sustainable architecture or green architecture by inserting the nature theme, incorporating natural elements such as air as possible, and by extending the natural landscape garden in the building. This building will broadcast 20% without air-conditioning at a given time can be used without air-conditioning and enough air to get well, but the risk is the problem of pollution, noise and dust the way of overcoming it is to reproduce the green elements as possible, although not optimal but can be cultivated office operation. The air-conditioning can be used only for 5-7 hours with automation system; we hope this building can save 15-20% because designing a quantitative area 20% with no air conditioning. Thus also reproduce the surface rain water reservoir, using catchment, drainage of rainwater reply was not discarded but direct-use.

According to the Director General of Water Resources (SDA), Ministry of Public Works (PU), **Mr. Iwan Nursyirwan**, actually the idea of this building has long master plan around 2003. The new concept of green building to save electricity is good lighting so as not to require a lot of lights and lots of open space and air-conditioning can be reduced as the elevator corridor and have applied all the existing **“Building of Action”** for people with disabilities, the blind and fire facilities.

Together, Regional Development Agencies revise the law on regulation of building construction activities from design stage through to implementation on site towards the friendly environment. Continually improving the RUTR (general plan spatial) and RTDR (spatial details of the plan) for the management of land use and structure for more optimal space, more effective policies and local initiatives to reduce disparities/administration direct to ecologically-based planning. The approach taken in planning can be:

- Administrative : An approach based on the laws / regulations
- Technical : The balance between waking and natural on the development footprint special treatment (hazard) in the damaged area with consideration of ecological, economic and aesthetic

Regional development of performance targets are also monitored by the Ministry of Energy and Natural Resources (ESDM), in making regulations for the building efficiency levels that will be applied as building-database-system to create the index for some typical types of buildings according to locality, continuing to dissemination to the general public and relevant agencies to promote public awareness that can enhance the level of awareness of energy efficiency in industry and construction planning. Things that must have to do is cooperate with the

Directorate General of Taxes of Republic Indonesia and Ministry of Finance active in providing incentives and disincentives in the form of ease of procedure and the tax rate policy.

In related to energy efficiency in Sustainable Building, in some cases, the simple incentives scheme can be shown from the cooperation the tenant of building (private or public) with the landlord (the government) to share the cost of their building operations, installations, replacement and maintenance. The recovery of cost is really proposition even accounting for tenant turnover and depreciation. Because it makes the landlord responsible for capital investment and might be can give the benchmark of energy use for the building toward reducing the use of the non-renewable resource. With the requirement, they must agree to the following provision governing rules.

### **The Green Investment Status**

Projections in Indonesia's economy improved in 2010 compared to 2009 made many sectors of business activities have the prospect of a brighter and is expected to grow rapidly, but besides that, also the dynamics of non-sectoral business activities which would appear to thrive well into the future of the business activities associated with environmental conservation live. Specifically grouped, activities related to business-friendly aspects of the environment can be divided into three main businesses. First, the efforts of producing goods that can directly reduce carbon emissions. This product is the substitution of fossil fuels which have been widely used but lack of awareness commitment from various parties in this respect. Second, the industry which supporting environmentally friendly activities and the industry with their work-environment friendly to the environment itself. Both of them simultaneously function as a complement of its main businesses. It can be seen from the building materials made in Indonesia will gradually produce more friendly to the local environment. As a supporting business in the short term, they cannot provide a significant contribution but slowly began to contribute the majority of income then, the investors who want to get more optimal benefits; this investment is a very wise choice. Most of them call it "Green Economy" in Sustainable Building.

### **Policy that Promote Sustainable Building Concept**

The implementation of the Green Building concept was supported by multi aspect, regulation from the central government, regulation of the local government; consultant, owner, and other stake holder give contribution to these issues. Anyway, this is a process that everybody in the different field must keep the effort to achieve. The society as acting the end user, also have a significant factor. It takes time to create the awareness among the stake holder and users. *Pamela Cepe et.al (2004)* suggest six steps to implement green building for local Indonesia's government :

- Inventory policies and programs that already exist
- Analysis of existing and future
- Discuss guidelines and existing program
- Achievements stake holder
- Develop a framework of green building
- And implementation

From this concept, it is clear that one of the most important things to consider in implementing green building is the availability of the policy or the regulation.

Rationally facts, Indonesia is the view that financing policies in about the environment is essential, cause pollution and natural degradation are just not environmental challenges that the economic consequences of environmental problems requires long-term response, because threatens on poverty eradication and achievement of MDGs, actions to address environmental challenges correlates to issues of equity and justice. The other way, Indonesia as a part of developing countries has limited options as they could not shift resources from their development agenda and poverty alleviation to environmentally sound.

The central government through The Ministry of Finance also provides the facility of import duty incentives, fiscal and tax facilities, including convenience, ease of licensing issues to improve competitiveness in order to drive investment in the country. In addition, the government through the Investment Coordinating Board (BKPM) to support all services in just one door to make it more easily, including industry and construction services to support the green building practices. This effort is commitments to reduce energy participate in preparing, providing and implementing sustainable construction. The regulations to be adjusted based on customs laws on tariffs for imported machinery, goods and raw materials in order to better provide legal certainty for taxpayers in the construction services business in meeting tax obligations.

### **Education and Training in Sustainable Buildings**

For the spirit of sustainability, we start analyze from the past to know the factors effecting settlement and sustainable building then, compared with the factors nowadays. Including their building values, characteristic and interpretation of those for today. If ready, the system of knowledge can be developed and know-how to be transferred through different means of training and education, create a curricula for each level of formal education and makes some model of information transfer for informal means of education for society. In Indonesia through *Green Building Council Indonesia (GBCI)*, had the objectives to promote the implementation of green building principles in all building sectors in Indonesia, in designing, constructing and operating schemes and one of the efforts is by developing a rating system "**GREENSHIP**" and buildings certification by Indonesia's own rating system to achieve a green standard. On the other hand, the formal education of building techniques and architecture has a key role for keeping the traditional values which we may consider to respect.

The education is existed before the building runs regularly. Start from soil, particles, gases, and bio-contaminants investigation until entering the building. Their concentration is directly proportional to the level of human activity in the building. Also when maintain a quality indoor environment requires special attention to these sources of pollution, which can affect the health of building occupants and maintenance workers. Poor knowledge can lead the health problems such as Sick Building Syndrome. We can adjust on the building's heating, ventilating and air conditioning (HVAC) system. Moreover creating environmentally sound housekeeping procedures, proper selection of cleaning and other chemicals used which stored in building can control the contaminants, also promote healthful surroundings and preserve building's appearance. Besides that, the management principles of education and training can be adopt for administrating an environmentally building; the green housekeeping and custodial practices for instance. The last, targeted building inspection containing basement crawls space and mechanical system area, et cetera.

*Green Building Council Indonesia (GBCI)* as a part of education transformation agent have a huge effect to encourage the people including architectural students, practitioner and government to change the mindset literally when saw the green principle not just only being

labeled or trend with sustainable or green separated-interpretation. We will educate the means of a green building not just one decked with planted boxes and sky gardens, however has brought us to a new level of awareness, giving a new design perspective when creating structures and using processes that are fully environmental responsible and resource-efficient throughout a building's life cycle from sitting to design, construction, operation, maintenance, renovation and deconstruction.

Indonesia is involved as one of the countries to implement green building principles as soon as possible and will disseminate it to the government institution, private, industry, association and university. Unconsciously, Indonesia already has what the people believed as a climate responsive building, but we do not standardize it. This is strengthened by the problems faced in Indonesia, like the lack of energy (especially electrical), the waste form the building, the lack of water. The answers of that, Indonesia will explore the study about the challenge in implementing green building which focuses on the evaluation. Survey to obtain current issues of the building is also done and some building designer are involved especially the newly built building in Indonesia.

In industry, Indonesia starts to fix the misleading between the companies and consumers on their environmental practices or their product's eco credentials. GBC Indonesia combat the Green-Washing seriously, especially on some of the material that claims to contain no dangerous contaminants like chlorofluorocarbons (CFC) and halon. As matter of fact, it is no easy to fight, where the consumers are mostly ignorant about the practice and the government lacks the political will to implement regulations.

In this situation, the profession and the industry in cooperate with GBC Indonesia already contributed actively in green education through the sponsorship of green design workshop, competition, networking, initiative and internship opportunities in architecture and another field dealing with sustainability. When the market aren't still doing it, then we invite the consumer had better read the fine print and do a double check before make decision to consume a material and product in a bid to reduce the footprint.

### **The Adoption of Sustainable Buildings Technologies and Techniques**

In the Declaration of Interdependence for Sustainable Future at Chicago1993, Indonesia stated that will apply the development process with all its supporting sectors, including production of building materials had to minimize its impact on the global environment by using efficiency methods energy resources, The implementation, we attempted to face several challenge of Sustainable Development adoption in the application of ecological buildings, moreover create the same perception for the consciousness and collective-vision to save our environment. One side, the cultural linkages just only for "best-buy" when consuming the product. Most of consumers will buy something with a lot of consideration. Sometimes they just follow the issue which was updated to say "green" or "sustainable" or indeed the motivation for change from the conventional practices towards environmentally practices. On the other side, Indonesia already thinking about sustainability is not expected that only the trend favored moment, not just the economic savings efforts, nor an attempt to return backwards and refused to advances in technology, more "Sustainability" occurs not only with the physical manifestation of the building but rather the appreciation and understanding to maintain harmony nature. The options exist in our hands, but eventually the people's demand will need a more comfortable life that can be put in forward.

In practices, Indonesia had best solution which must be applicable not only for the newly-built buildings, but also the old building as well. The green building principles that already applied shown benefits consist of lower operating costs, lower energy and water consumption and less waste. In more economical value when the construction was complete, also provide a lower insurance level, lower cost to reconfigure space, higher return on assets, increased property value, enhanced marketing ability, reduced liability from tenants becoming sick, reduced risks as buildings more likely to remain competitive, green productivity, staff retention, reduced tenant turnover and absenteeism. Shortly, it improved organizational culture, morale and wellbeing.

Some of the adoption of Sustainable Development techniques shown at the creating of Eco-City in Indonesia, Sentul City, West Java for instance. They order to navigate the developing and build the city more comprehensive and rapid in accordance to the today's demands and the future. Their development focus on making the green implementation that matches on local weather and regional potential to harmony the nature. To have a conception of nature that it can minimize the negative side effects caused by the actual building of its physique. Cultural and heritage aspects are also serve a consideration in the development of the Sentul City beside their entertainment attraction and tourism destination.

### **Wisma Dharmala (Intiland Tower) - Jakarta**

One of Paul Rudolph's building, Wisma Dharmala has been considered as one of the best sustainable building in Jakarta, Indonesia. In addition, the government cited it to be an example of how other buildings should be design to preserve local environment. Its highly complex geometrical pieces was designed to meet more than just the esthetic merit, but also to gain a better natural air flow and lighting in order to greatly reduce the need for air conditioner and artificial lightings. Rudolph said, "Indonesian traditional architecture offers a wide variety of solution to the problem of a hot and humid climate. The unifying element in this rich diversity is the roof (Rudolph, 2009). It is true, that Indonesian traditional eloquently solved the problems posed by the humid hot climate.

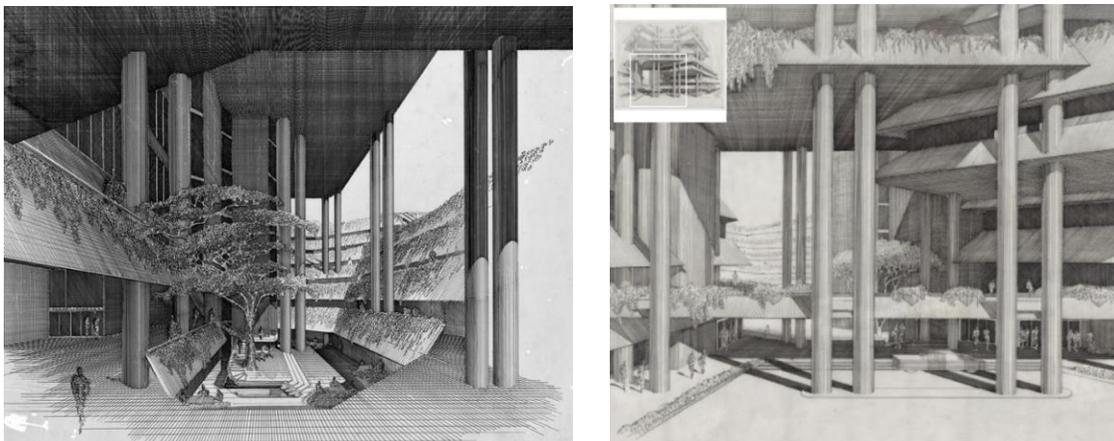


Figure 1 & 2 : Wisma Dharmala Sketch Impression, source : Arch Net, Rudolph, 2008

Natural air flowed was coaxed through their structures by following the simple laws of hot air rising, leaving cooler air at the occupant's level, venture-like openings followed the laws of air dynamic both horizontally and vertically. The passage of air was achieved by raising structures above the ground, breezeways, venture openings in walls and roofs, controlled windows openings, manipulation of shade, shadow and light modulated in breathtaking array of roofs.

Each has been precisely shaped through centuries of trial and error to fulfill a precisely defined function, to produce imaginative and beautiful vernacular architecture.

The unifying elements in the Indonesian's rich diversity of vernacular architecture are the roof which in Indonesian hands has produces some of the world's most beautiful buildings. The Wisma Dharmala office building takes the "roof" adapts it to a high rise, air conditioned office buildings and its supporting functions. Most importantly the building is designed to give a sense of place of being appropriate to Jakarta. It is the antithesis to the anonymous air-conditioned box constructed all around the world.

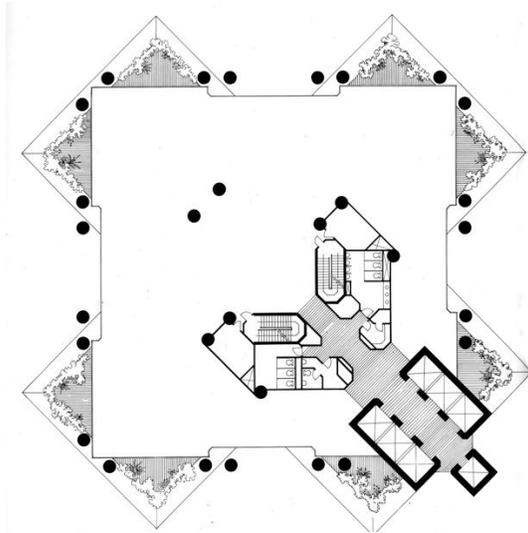


Figure 1 & 2 : Wisma Dharmala Floor Plan



Each floor of the office building has its own roof-spandrel with overhang to protect the glass from the direct rays of the sun. There are typical floors, which twist and turn as the building ascend to the top. This geometry allows the façade and the roof's to form balconies and terraces for many of the offices floors. The base of the buildings provides a covered entry under courtyard with exterior steps leading to a sunken terrace surrounded by varying kinds or restaurants. This courtyard is essentially a breezeway shaded by the mass of office building overhead, so each floor of the courtyard steps back forming a balcony for the offices that floor. Thus the space at courtyard expands with each floor forming an inverted funnel to catch the natural daylight. Overhangs at each floor are covered with vines making the walls of the courtyard green. The office towers starts some thirty meters above the base, allowing light and air to penetrate all parts of the buildings. The building can be seen as "floating" above its base giving the whole lightness which it would not otherwise posses. The shortcomings of this building are not successful in behavioral adaptation between the user and architect who created the design. In daily use, lots of wasted space occurred because of the typical plan form. For some space, also requires that artificially ventilation increase the burden of energy consumption in buildings. The maintenance is also difficult for the facade because the roof is too steep.

### **Central Library, University of Indonesia**

The central library building at the University of Indonesia, Depok. This facility was built over an area of 2.5 hectares with a total building area of about 30,000 m<sup>2</sup>. The eight-floor building is targeted for completion in 2010. This library building was designed resistant to the earthquake

and support the sustainable building concept. Some energy needs using renewable sources like solar energy. The library's architect is **Mr. Budiman Hendropurnomo**. With the green building concept is the raw material used comes from the country. For example *andesite* stone or similar stonemarble imported from Cianjur, West Java

To reduce the use of electricity in the room, the wall facing the lake using double glazed to obtain natural daylight glass. Not only have that, the waste watered from the building so it can be recycled to water the plants used in the building environment. "Apart from the UI concern for the environment, the government established new rules that the building should be specialized in green building.



Figure 3,4,5 & 6 : Central Library, University of Indonesia (source : Denton Corker Marshall , 2009)

*"To create a beautiful building that is easy, but making it environmentally friendly hard,"* said the architect. The library building when viewed from afar as the inscription in the mountains because some roof cover was designed by using green roof system that integrates with the surrounding site. regulations to direct the user's behavior to be compatible with the built environment is realized by not allowed the use of excessive plastic waste in the building, smoke-free, rich in reforestation, save electricity, paper and water. Another thing of concern is the restrictions on Accessibility for motor vehicles near the building, but provides access for pedestrians and bicycle users to pollution levels that come into the building can be muted.

## **Indonesia's Ecohome, ATMI IDC - Holcim Indonesia, Surakarta**

PT. Holcim Indonesia Tbk. (Holcim Indonesia), in collaboration with a number of business partners and the Academy of Mechanical Engineering Industry (ATMI) Solo, inaugurated the International Building Development Center (IDC) ATMI in Solo, Central Java. The concept of eco-home, which became the basic concept of building an IDC is a new innovation, and part of the Holcim Indonesia contribution to sustainable development (sustainable development) in Indonesia, which later eco-home concept will be applied to other constructions, particularly public housing.

Two-storey building was built in six months and up beautiful in *Adi Sucipto Street, Solo*. Its construction also use building materials produced in house solution outlet, so it is more efficient from a variety of things: reducing the use of woods, faster processing and lack of the use of discarded materials. As an initiative partner of Holcim Indonesia, Home Solutions (outlet) is integrated in the provision of building materials, access to financing, construction methods and design consultation. With the integrated system, the development and use of this building have been implemented:



Figure 7 : Ecohome – ATMI IDC, Holcim Indonesia, Surakarta, 2010

First, Water management. At The Eco-home, some of the interlink water management features the catchment of rainwater into the groundwater tank, proper grey and black-water treatment, purification and drink water treatment, the use of advanced water application like grease trap and relevant low rate water appliances which leads into a water efficiency up to 46%, 42% self sufficient water supply and reduction of storm water.

Second, it is the efficient energy management. Those begin with site understanding and optimization of passive design solution, whereby the building responds to the existing sun orientation, induces airflow and specifies finishes that absorbs less heat. Cooling in a building takes up to 70% of its total energy consumed during its operation. Insulation and air-tightness of air conditioning becomes very important key factors to reduce the energy consumption, matched with the installation of smart appliances.

Third, Waste management which domestic waste is a prominent in household development. The Eco-home optimizes its domestic waste management through both changing the mindset of the occupants and also providing the system to allow easier management. The occupant needs to understand the importance of classifying waste which will be channeled to recycling industry



its rating system **GreenShip**. In February, the **GreenShip Associates** training has been held to introduce the concept and draft of the rating tools for GBCI members. In the future, Green Building Council Indonesia as a not-for-profit bodies which charged with driving the transformation of markets with regard to green buildings will promote the implementation of green building principles in all building sectors in Indonesia, in designing, constructing and operating schemes, one of the effort is by developing a rating system and buildings certification by Indonesia's own rating system to achieve a green standard. They are set up under the auspices of the World Green Building Council (WGBC) which works to set quality standards and to share knowledge around the globe.

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